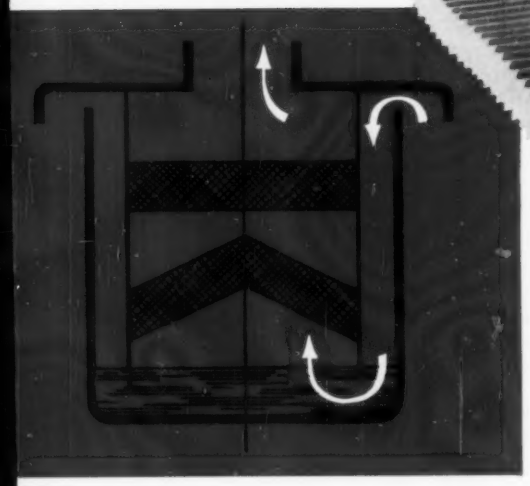
diesel power

March 1961

geared to the needs of original equipment manufacturers and equipment superintendents in the field



air cleaning selection

TEXACO DIESEL DATA

HOW TO SPOT FUEL INJECTOR PROBLEMS

The fuel injector is a most important and complex part of a diesel engine. The effects of a badly adjusted fuel injector can run all the way from increased fuel and lubricant consumption to ring and bearing failures.

Here are some of the characteristic symptoms you'll get if your fuel injector is acting up, and what the most likely cause of each symptom is.

1. Symptom: Heavy black smoke at exhaust; loss of power; rough idling.
Probable Cause: Incomplete combustion, due to worn injector nozzle.

2. Symptom: Rough, noisy engine; stuck or broken rings; bearing failure in most severe instances.
Probable Cause: Pre-ignition, resulting from premature fuel injection. Causes extreme high temperatures and pressures in combustion chamber.

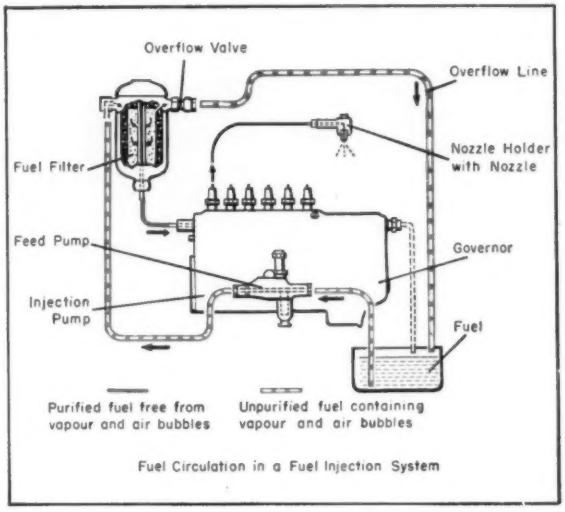
3. Symptom: Smoky exhaust; heavy soot deposits in engine and crankcase oil.
Probable Cause: Incomplete combustion due to late injection.

4. Symptom: Premature ring wear in some cylinders, heavy varnish formation in other cylinders; engine sounds uneven under load; white or light-blue smoke when engine is idling; dilution of lube oil.
Probable Cause: Improperly equalized injectors, which pump too much fuel into certain cylinders, starve others. "Over-fed" cylinders do most of the work.

Some of these symptoms can be cured with a comparatively minor adjustment; others require more involved techniques.

Improperly equalized injectors, especially on large engines, can be double-checked by a speed-drop test. This involves cutting out one cylinder at a time while you're checking the engine speed with a tachometer. The speed will fall off the most when you cut out the cylinders that are getting the most fuel.

Some folks try to get more power out of an engine by injecting more fuel than the engine was designed to take. You do get more power this way, but it's at the expense of your rings and bearings, and the exhaust becomes excessively smoky. The following chart shows the increase of ring temperature and exhaust smoke on a 4-cycle diesel experimentally overloaded with fuel:



Fuel Circulation in a Fuel Injection System

Fuel/Air ratio	% rated load	BMEP	% exhaust smoke*	Ring groove temperature
.03	67	51	7	336
.04	100	76	7	372
.05	112	85	16	396
.06	114	87	69	402
.07	113	86	92	397
.08	111	84	97	388

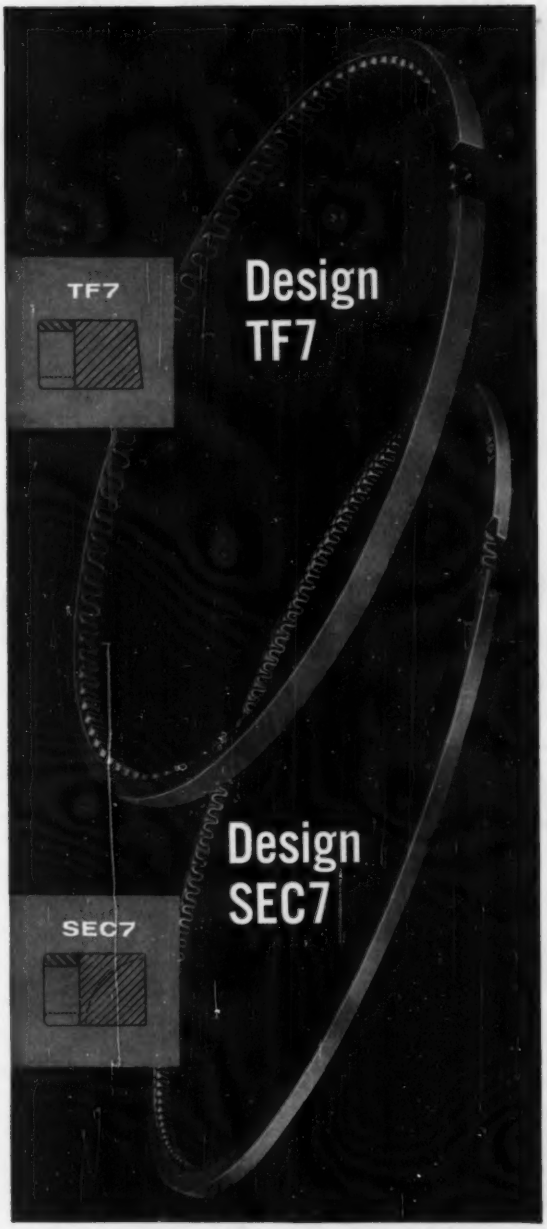
*Smokemeter reading.

Because a fuel injector is as carefully built as a good watch, it's best to let your manufacturer's service organization help you out with maintenance and repair problems. The most valuable type of preventive maintenance the diesel operator can do is to keep the injector clean. That means no disassembling of the unit in a dusty or otherwise contaminated atmosphere. It also means that you must use nothing but *clean* fuel. Contaminated fuel can ruin a fuel injector nozzle within a few days. You have to be particularly cautious if your injector isn't equipped with a dependable fuel filter. Water in the fuel is objectionable too, not only because it gives uneven engine operation but because it promotes corrosion of valve parts.

Fuel injector problems are best handled by trained experts. The same is true of diesel fuel and lubrication problems. Texaco has many, many years' experience in fueling and lubricating diesel engines of all sizes, in all types of operations. If you're having a problem with diesel fuel or lubricants, contact Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

TEXACO

Throughout the United States
Canada • Latin America • West Africa



TF7 DESIGN—Pedrick Conformable Taper-Face Compression Ring. Taper face provides a line contact with the cylinder wall for quicker seating and sealing, less chance of scuffing. Used in combination with the exclusive "Equalizer" in certain grooves of Pedrick Engineered Installations according to engine conditions and operating requirements.

SEC7 DESIGN—Pedrick Conformable Seal-Cut Compression Ring. Consists of a single-piece cast-iron section of considerably less radial thickness than non-conformable conventional rings, plus the exclusive "Equalizer". Most effective in sealing not only between ring and cylinder wall but at the gap because of special design overlapping ends. Used most commonly in the lowest compression groove.

PEDRICK *Conformable* COMPRESSION RINGS GIVE...

MORE POWER... LONGER LIFE ...HIGHER EFFICIENCY

By the time combustion gases reach lower compression rings, there is often insufficient pressure available to force the cast iron rings out against the cylinder wall. This may result in an unsatisfactory seal. Pedrick solved this problem by introducing the specially designed "Equalizer". This steel expander exerts a uniform outward pressure against the cast-iron ring, and assures a positive seal between ring and cylinder wall.

In addition, the special 2-piece construction makes it possible to reduce the radial thickness of the ring. Accordingly it is more flexible and therefore more conformable.

It is the combination of this conformability and the pressure exerting "Equalizer" that assures you effective sealing, freedom from blow-by and full power at all times.

You can put Pedrick's extensive experience in the design and application of conformable compression and oil rings to work for you in solving your particular ring problem by contacting our Engineering and Consulting service. We'll be glad to hear from you. Write or phone: WILKENING MANUFACTURING CO., Philadelphia 42, Pa. In Canada: Wilkening Manufacturing Co. (Canada) Ltd., Toronto 2.

Pedrick PISTON RINGS

PEDRICK PIONEERED *Conformable* RINGS FOR BIG-BORE ENGINES

For more information write in No. 2

NEW FROM CLARK

Big planetary bogies— capacities: up to 90 tons speeds: up to 50 mph

Planetary axles—one of the most important cost-saving developments of the past six years in truck cranes and earthmoving machinery—are now available for the first time for big on and off-highway trucks.

These big new axles—providing, in tandem, carrying capacities up to 180,000 lbs—are built by Clark, the company that has made more planetary axles than all other firms combined.

Fully field tested and proved, these big axles are geared for continuous speeds up to 50 mph without overheating!

They provide the same basic advantages which have proved so important to truck-crane and earthmover users. By putting final power reduction *at the wheel hub*, they take 70% of the strain off the drive train . . . thus greatly reduce breakdowns and virtually eliminate axle shaft problems. Through reduction in torque loads and hence smaller gears and shafts, vehicle deadweight is substantially reduced too. So is maintenance.

If you design—or drive—such big vehicles as dump trucks, mine-haulers, or concrete mixers, you'll want to check these big new Clark planetary bogies first-hand. For more facts, write or call.

FOR CONCRETE MIXER TRUCKS

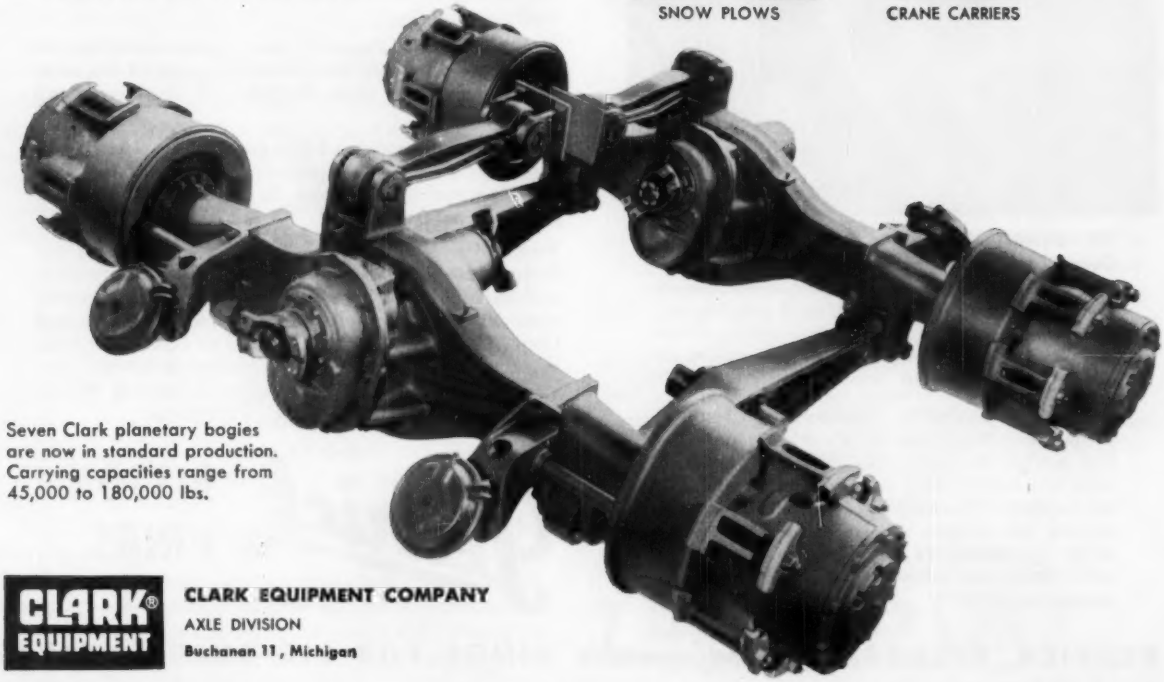
LOGGING TRUCKS

OIL FIELD TRUCKS

OFF ROAD HAULERS

SNOW PLOWS

CRANE CARRIERS



Seven Clark planetary bogies are now in standard production. Carrying capacities range from 45,000 to 180,000 lbs.

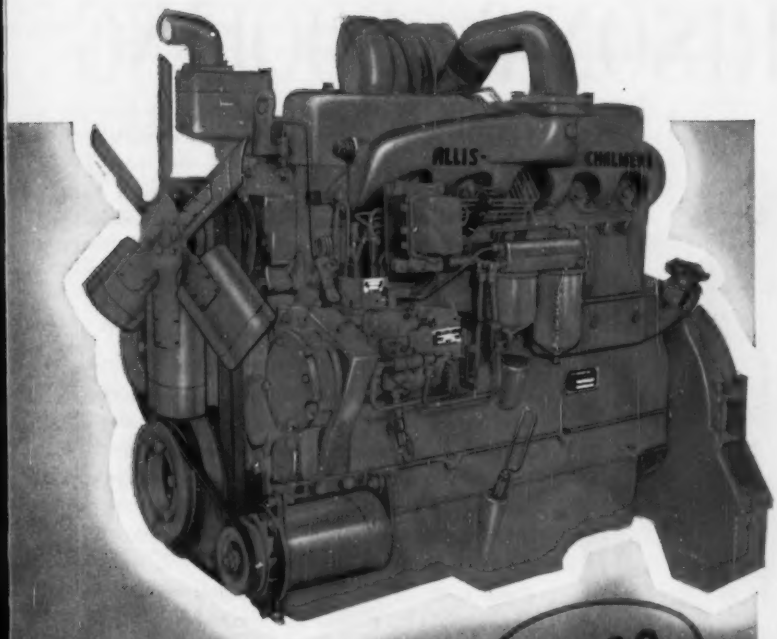
CLARK® EQUIPMENT

CLARK EQUIPMENT COMPANY
AXLE DIVISION
Buchanan 11, Michigan

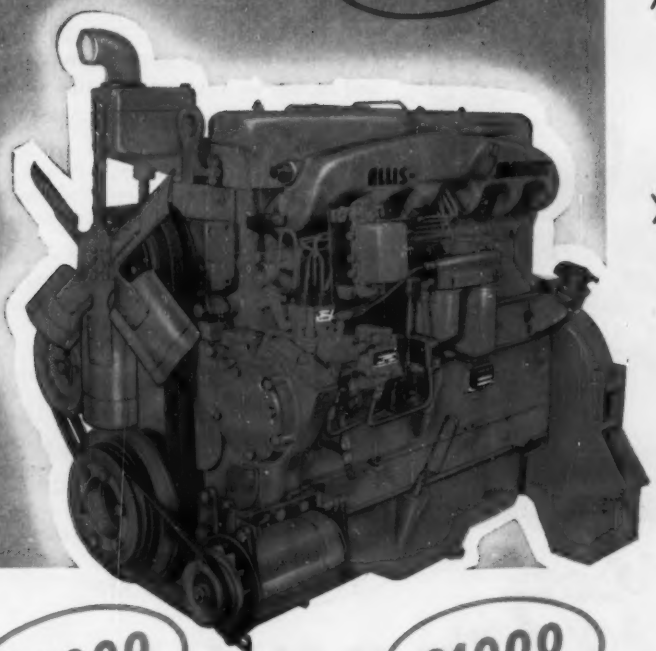
For more information write in No. 3

11000 and 10000 JOIN THE AC TEAM OF MODERN DIESEL

WORK POWER



210 hp (turbocharged) **11000**



145 hp **10000**

350 hp (turbocharged) **21000**

235 hp **16000**

Now there are four of a NEW kind ... designed to give you...

LIGHT APPETITE FOR FUEL

Controlled turbulence mixes fuel and air thoroughly. Assures complete combustion — fuel savings to 27% and more!

"This new engine is not only doing the work of the larger engine it replaced, but is saving 30% and more on fuel!"

HIGH, SUSTAINED TORQUE — RAPID RESPONSE

You have **work power** that hangs on to overloads over the entire speed range.

"Amazingly rapid response under heavy loads."

CLEANLINESS IN DESIGN AND OPERATION

Efficient combustion converts fuel to **work power,** not smoke. There is no excess "plumbing" to invite service problems.

"Their clean, simple design makes them easy to service. To our knowledge, they are the best buy in a diesel engine for rough work today!"

FAST STARTING

These engines start "right now" directly on diesel fuel. No ether, no pre-heating, no long work-robbing warm-ups even in freezing temperatures.

"Starting is excellent, even in the 0 to 10° range which we have fairly often here."

• • •

Find out how profitably this new kind of **work power** can serve you. See your Allis-Chalmers dealer or write for free bulletins — BU-718 on the 11000 and 10000; BU-540 on the 21000 and 16000. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

POWER FOR A GROWING WORLD

BE-24

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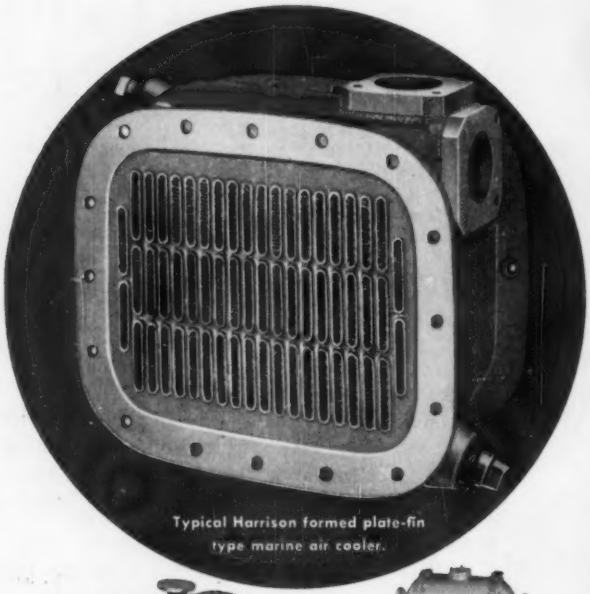
General Motors Reliability in Action...

MISSISSIPPI TITAN RELIES ON GM HARRISON for COOLING



Typical Harrison formed plate-fin type marine air cooler.

Harrison heat exchangers are quality products of General Motors Research and Engineering.

HARRISON OIL COOLERS PROVE RELIABLE IN VITAL APPLICATION

Plying Mississippi waters between St. Louis and New Orleans, the MV UNITED STATES, one of the nation's largest towboats, does a whale of a job. And there's plenty of cool auxiliary power on board with Harrison oil cooler-equipped GM Diesel engines. Reliable Harrison heat exchangers are specified for the Diesels that power the generators furnishing vital electric power for communications, lighting, air conditioning and navigation aids. Harrison reliability—"measurable excellence"—results in heat transfer products that do the job you want them to do . . . for as long as you expect them to do it. This is the kind of reliability you can get in a wide range of basic types of Harrison heat transfer construction—a complete line of designs which permits the selectivity that assures the *right* heat exchanger for every application. Save time and money on your temperature control problems—call in a Harrison Sales Engineer at the design stage.

Free For an informative 48-page brochure on the complete Harrison line . . . write to Department 902.

GM HARRISON

TEMPERATURES MADE TO ORDER

AIRCRAFT, AUTOMOTIVE, MARINE AND INDUSTRIAL HEAT EXCHANGERS

HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, NEW YORK

For more information write in No. 5

diesel power

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BPA

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#1 Piston choice of Diesel Engine Builders KEEPS ENGINES POWERFUL LONGER–AT LOWER COST

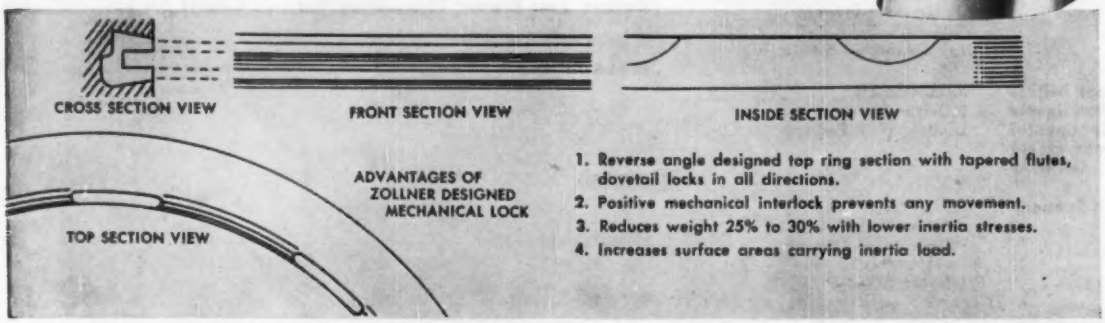
BOND Z LOC

Exclusively DOUBLE BONDED
"Ni-Resist" IRON TOP RING SECTION
METALLURGICALLY A1-Fin Process
MECHANICALLY Zollner Lock

Design adaptable to any type pistons

Stops Ring Groove Wear

Everywhere, engine builders and transport operators enthuse over the performance of Zollner Bond-O-Loc Pistons — "The greatest mileage piston we have ever used. Top ring groove wear problems are eliminated by the 'Ni-Resist' Iron section **permanently** incorporated with the double bond of both A1-Fin metallurgic **and the exclusive** Zollner mechanical lock." For longer piston life, better performance and lower maintenance cost, we suggest your immediate test of Bond-O-Loc advantages.


CROSS SECTION VIEW
FRONT SECTION VIEW
INSIDE SECTION VIEW
ADVANTAGES OF ZOLLNER DESIGNED MECHANICAL LOCK
TOP SECTION VIEW
1. Reverse angle designed top ring section with tapered flutes, dovetail locks in all directions.
2. Positive mechanical interlock prevents any movement.
3. Reduces weight 25% to 30% with lower inertia stresses.
4. Increases surface areas carrying inertia load.

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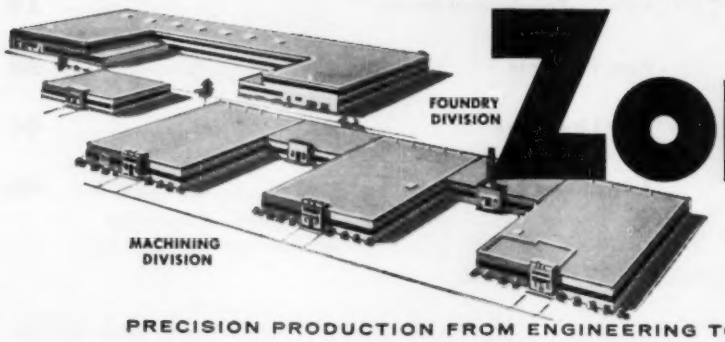

ZOLLNER
HEAVY DUTY PISTONS

PRECISION PRODUCTION FROM ENGINEERING TO FOUNDRY TO FINISHED PISTONS

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diesel power

editorially speaking

Distributors As OEM's

Engine distributors and dealers are key people in today's engine sales pattern. They're out on the firing line, face to face with customers and in the best position to know their needs, their problems . . . and meet them! We've said this before and we say it again. In recent contacts, we've not only had this idea confirmed but we've been struck with another facet of distributor-dealer activity—they're becoming OEM's of many and varied types of equipment! In more and more cases the engine distributors are building complete diesel-powered packages . . . turn-key units tailored to a need that might be specific to their area. We've seen them building everything from specialized precise-power generator sets to complete oil well servicing trucks. This is going on throughout the country, although in different products and in varying degrees. It's impressive to see the complexity of some of the units produced, particularly when you realize the scope of engineering involved. The point, here, is that we are developing, let's say, a "second layer" of OEM's that are changing somewhat the original meaning of the term. The common concept of an Original Equipment Manufacturer is someone that factory-builds a complete unit, ready to go to work. This OEM might build everything that goes into the complete unit but more commonly he relies on suppliers for various components. Thus the OEM becomes the sales target for the suppliers of everything from engines to oil pumps. So far, so good . . . but notice in this concept there is nothing to exclude the engine distributor who is also building a complete equipment package. It's just that a lot of suppliers never thought of it this way. In fact, for some types of component and accessory items, this "second layer" of OEM's is the most promising market. Factory-type OEM's very often cannot include these items, perhaps because of standardization, perhaps because of competitive pressures. So if the term "OEM" crops up in your merchandising plans, think about this idea. Reaching them might well increase your sales potential and give some new direction to your merchandising efforts.

B. P. E.

High Tensile Iron Pistons

Increase the dependability of your engines with G&E High Tensile Iron Pistons. Each one is designed, cast, and machined to your specifications, to give you uniform operating characteristics.

Why not take advantage of more than 90 years of casting and piston machining experience at G&E. Complete facilities from lab to label assure efficient, economical production.

Write for complete information—include your specifications.

G&E HAS COMPLETE CASTING FACILITIES

We cast any product high-tensile iron, aluminum alloy, bi-metals. Tell us what you want.

See G&E Products at S.A.E. display, Milwaukee September 12-15. Booths 461 & 462.

GILLETT & EATON, Inc.

846 DOUGHTY STREET, LAKE CITY, MINNESOTA

Casting and Piston Specialists • Established 1868

Sold in Canada by Gould National Batteries of Canada, Ltd., Port Erie, Ontario

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diesel power

highlights

SPECIAL-BODY TRUCK LEASE

Special-body over-the-road trucks used by industry can now be leased without maintenance, repair and garage service for from four to eight years . . . According to the leasee, there is no limit to the type of special bodies and chassis that can be leased. Units can be engineered to meet unique requirements.

WHY TRUCKS BREAK DOWN

In a recent survey, 82% of the reporting companies stated that failures in the electrical system were responsible for most of their road failures . . .

DIESEL STUDY FOR YOUNGSTERS

A school in Maryland had some construction nearby, and the alert teacher allowed the youngsters to get right in with the engines, with supervision from the construction men. Both boys and girls got interested enough for the teacher to get books, and arrange film and talks by the construction men. To these youngsters, diesels meant modern. As one impressed youngster remarked . . . "If you want a hard job done, diesel does it". What's that bit about "from the mouths of children pearls of wisdom flow" . . .

AID TO UNDERDEVELOPED AREAS

The Marine Diesel Training Center, started four years ago by the International Labor Organization, has been handed over and is being operated entirely by the Burmese . . . Burma has one of the largest inland water fleets in the world, suffered from a shortage of diesel mechanics when the fleet converted from steam to diesel after the war.

QUEENS OF THE ROAD

For the past two years, two gals from California have been pushing a COE diesel tractor and a 35-ft reefer all over the country. The gals own the rig, but are now planning to sell it . . . it's too small for them . . .

DIESELS REPLACE ELECTRICITY IN LONDON SUBURB

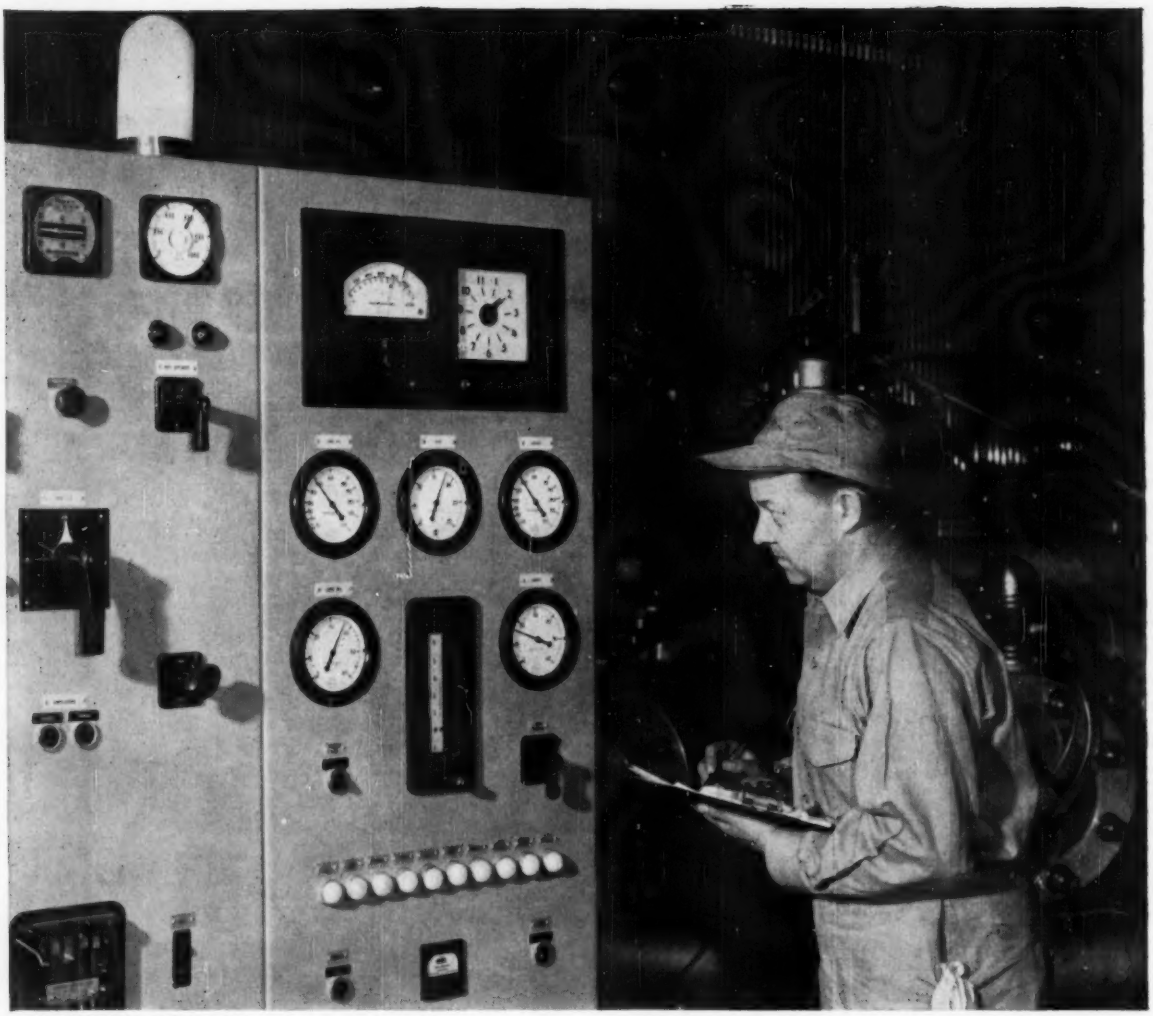
London Transport has received more than 600 diesel-engined buses from the nearby A.E.C. works, placing them in immediate service on a route that has been served by electric trolleybuses since 1906.

RUSSIAN CARS HAVE BRITISH DIESEL ENGINES

British Perkins Four-99 diesels are being fitted to Russian Volgas in Belgium. Brussels distributors are making the installation . . . hope is to capture a big part of the taxi cab market. Perkins-powered Volgas are least expensive of all diesel-powered cars available in Belgium . . . and 100 similar engines have been suppied for similar installations in Finland . . . As yet, no orders from Moscow.

DIESELS EDGING OUT GASOLINE-ENGINED VEHICLES IN SWEDEN

1960's "Motor Traffic in Sweden" bulletin shows that diesel engine usage has made significant gains over petrol engine usage in all vehicular applications. Percentage-increase of diesels in use today, compared with 1950's registration figures, shows that passenger cars have made 435% increase (432% for petrol engines); truck diesel usage has increased 292% (118% for petrol engines); tractors have increased 324% (265% for petrol); and buses have gained by 147% (in this category petrol engines gave up 55% of what they had ten years ago) . . .



Nordberg Diesel Installation Photo

Diesel Protection Assured with the *Alnor* Pyrotac®

A continuous check on the operating efficiency of each cylinder in a diesel engine is indicated on the Alnor Pyrotac.

Improper injection, blow by, stuck rings, failure of cooling, overload, or other malfunctioning of the engine is immediately registered by the individual exhaust thermocouples and is indicated on the dial of the Pyrotac. When the instrument is set for the normal exhaust temperature range, any variation up or down shows up immediately on the Pyrotac dial and an alarm signal informs the operator.

The motor driven switch unit of the Pyrotac monitors the exhaust temperatures of each cylinder continuously, thus any trouble in an individual cylinder can be spotted immediately.

Alnor Pyrotac models are available up to 20 circuits. Manually operated pyrometric indicators are sufficient in some installations.

Most diesel power plants operating today are Alnor equipped. Write for bulletin 4703.

Alnor INSTRUMENTS

ALNOR INSTRUMENT CO.

Division of **Illinois Testing Laboratories, Inc.**

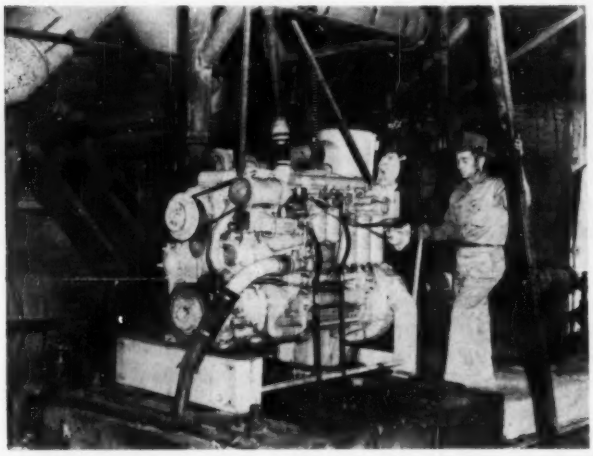
Room 507 • 420 North La Salle Street • Chicago 10, Illinois

For more information write in No. 8

diesel power

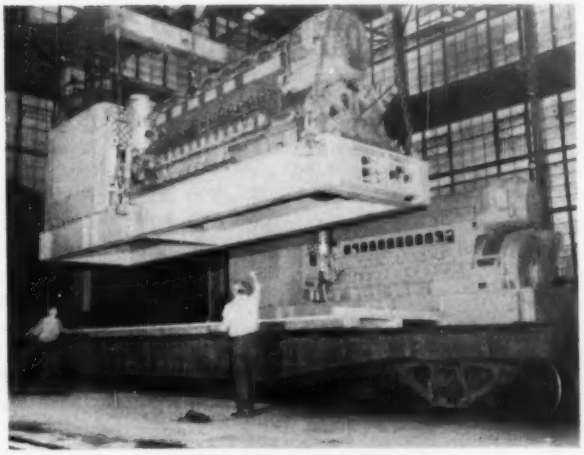
news section

Packaged and Ready To Go!
Stewart & Stevenson's Maplewood Assembly Plant shows portions of production amounting to 933 types of power applications. Self-propelled diesel engine-driven generator sets for airport utility service are in the production line, while engines are tagged and ready. The GM 4-71 modified E power units near the utility vehicles are waiting for 400-cycle AC generators and power transmissions for airport utility; GM 2-71's are for reefer car service on the Santa Fe.



Power for William's Powerful Gin!
William's Gin serve the local farmers, but this particular gin produces 100 bales of cotton daily. An International UDT-817 turbocharged diesel engine, transmitting through a single output shaft and a system of pulleys and belts powers the cleaners, burr machines and all blowers for five gin stands. This Bonham, Texas, application of diesel power does a better job cheaper.

Off to Venezuela!
Fairbanks-Morse 12-cylinder 1920-hp spark-ignited natural-gas engine powering a 1360 KW 3-phase 60-cyle 4160 volt generator. The 48-ton self-contained unit is on its way to Phillips Petroleum's Southern Monagas oil fields. Additional parts in the shipment allow operation on oil or as dual-fuel. Radiator and fan are separate unit, can be located anywhere, including remote. Lifting eyes in subbase will be removed from slots to eliminate protrusions. Three other identical units are already on the water, soon to supply prime power for producing, gathering and pipe line transmission of crude.



Marketing Agreement

Fairbanks, Morse & Co. is expanding its diesel engine line through an international marketing agreement with W. H. Dorman, Ltd., of England. Dorman will ship stripped basic engines, with fuel injection equipment, after bench test. FM's Beloit plant will fit American-made filters, electrical equipment, piping, clutches and general hardware.

Simms Builds Cold Room

Simms of England—where it never gets *really* cold—have built a

room that can be brought to −40°F. They use it to cold-start-test engines. Facilities will be rented to companies desiring cold testing.

Another Standby

The city of Pawtucket, R. I. has just purchased a 500-hp Cat D397 turbocharged engine driving a Worthington 14LA3 two-stage centrifugal water pump. Clutch is by Twin Disc with Falk Steelfax coupling. Capacity: nine million gal/day.

Thin-section braze technique

Use of furnace brazing and L. M. Nicrobraz brazing alloy has been used to successfully assemble a thin wall expansion bellows into a diesel engine exhaust tube assembly. Stainless Processing Div. of Wall Colmonoy Corp. did it in their Detroit plant. The two pipe sections are slipped into the sleeve end of the bellows and placed in a fixture. Nicrobraz alloy is applied and the part is placed in a hydrogen furnace at 1900°F.

GM Aid to Distributors

GM Detroit Diesel has formed a Distributor Facility Planning Section at Detroit. The service is aimed at the adoption and arrangement of facilities proven most effective in servicing engines in vehicular, industrial, construction and marine installations. The service is available at distributor request. Ralph Pontius has been appointed head of the section.

Especially For YOU!

Calling all Petroleum Co. Engineers to participate in a program of instruction covering the design, operation and maintenance of current GM Diesel models. Sponsored by the Detroit Diesel Division of GM at its training school in Detroit, the courses will emphasize fuel and lubricant requirements under new and varied operating conditions.

If you're in product research, or concerned with the production and distribution of petroleum products, look into these courses . . . just one week of classes, limited to 30 members, allowing for maximum participation in the laboratory sessions.

Hands Across The Sea

ALCO Products (formerly American Locomotive Co.), New York and the Davey, Paxman and Co., Ltd, Colchester, England, will collaborate on diesel engine design and manufacture for world markets. According to an announcement by W. S. Morris, ALCO's president and Geoffrey Bone, managing director of the British concern, Davey, Paxman will have the advantages of ALCO's experience with diesel engines for locomotive, marine and stationary applications, and will have the right to manufacture and sell them outside the US. ALCO will make and sell Paxman's diesel engines of a different type and size than those on their own line.

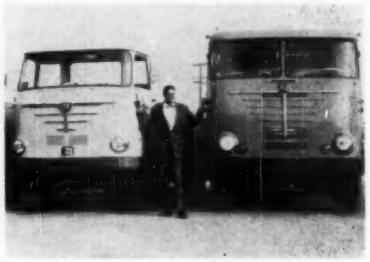
The firms will be in a position to improve their efficiency in their respective world and home markets as a result of the agreement.

Moline furnishes power trains and components

Minneapolis-Moline has established an Automotive Division with a full line of gasoline, LP gas, diesel and natural gas engines as well as transmissions, torque converters, shuttle gears, axles, gear boxes and related products. The division also provides consulting service in the design and application of Moline products to original equipment built by other manufacturers.

New diesel Truck line

Buessing, West German producer of a diesel-powered truck line, is entering the U. S. market. Range: 5-ton capacity and up, plus buses.



VP K. Egger-Buessing and two diesels.

Standby for Bank

N. Y.'s Chase Manhattan Bank has installed a Cat D375 just in case the power fails again in New York. Apparently a dark bank presents a problem. 18-ton emergency power package was supplied by H. O. Penn, who raised it 61 stories to the roof by crane—presumably also powered by a diesel.

From FPC

El Paso Natural Gas has been granted authority to construct and operate a 3400-hp addition to its Eunice Field compressor station in New Mexico.

Cities Service is authorized to develop the Alden Field in Kansas as an underground storage area. Will require 27,950 additional compressor horsepower.

Cummins-approved engine rebuild course

"Cummins Engine Unit Rebuild" is offered as companion to Interstate Training Service's (Portland 12, Oregon) first Cummins-approved course "Principles, Maintenance and Repair of Cummins Diesel Engines". To qualify, the first course must have been completed. Both courses are, however, available in a single study manual program.

Budd-ATA Continues Maintenance Study

Field visits in connection with phase-3 of the Budd Co.-ATA Foundation study are beginning. This phase consists of examining carrier's unit cost records for repair and servicing line-haul vehicles. Object is to feed data to processing machines to study regional differences in repair costs and cost differences in vehicle age groups of the country's major fleets.

Turbos go — and go!

A pair of T3011 AiResearch turbochargers have been found trouble-free after an impressive 30,000-hr of continuous operation of a Clark Bros. natural gas pumping station at Richfield's South Cuyama and Filmore, Calif., station. They'd been in operation for 3½-yrs.

GM's "Top Six"

After a close race, six members of Detroit Diesel's Service Craftsman's Guild have been named the top six. The list is Thomas J. Fay, Hubbs Engine Co., Boston; William Poddick, DD Branch, Miami; Anthony N. Slaga, Ray C. Call, inc., Steubenville, Ohio; Robert L. Hughes, Western Services, Mt. Carmel, Ill.; Glen Hawkins, Stewart & Stenenson, Houston; and Henry W. Erickson, Modern Motors, inc., Seattle, Wash.

Promotional Run

A Leyland Super Comet diesel tractor and fully furnished trailer van is on a promotional cross-country run.

Caterpillar Forms Swiss Unit

A Swiss subsidiary of the Caterpillar Tractor Company has been formed. Known as Caterpillar Overseas, S.A., it will take over selling and servicing Cat products in most areas outside the Western hemisphere. Local Cat companies will continue in Australia and the United Kingdom.

Geneva will be the headquarters for the new company. The move will take the next several months, with technicians and special personnel being sent to head the operation. V. V. Grant, vice president of the company's foreign trade group and a former treasurer of the parent company will be president of the new subsidiary.

ASME Oil & Gas Power Conference

The 33rd Annual Oil & Gas Power Conference and Exhibit will be held at the Jung Hotel, New Orleans, April 10-13th. The theme of this year's conference is "Engine Fuels of the Future."

Featured speaker at the conference (Monday evening) will be Dr. Martin A. Elliott, gas engineer and director of the Institute of Gas Technology. Dr. Elliott will cover the role of fossil fuels in supplying energy demands. His discussion will range into projections of energy demands, the availability of natural petroleum and natural gas, and the long range problem of the synthetic liquid fuels and synthetic pipeline gas from coal and oil shale.

Dr. Elliott has indicated that he may devote a portion of his talk to new power generation techniques such as thermo-electric devices, thermionic devices, fuel cells and magneto-hydrodynamic generators. In addition, a full technical program is scheduled over the four days.

Monday AM, papers on operation and application of diesels, dual-fuel and spark-ignited engines. Tuesday AM, papers on combustion, and an afternoon inspection trip. Wednesday's papers treat trends in fuels and performance on various types, and Thursday's papers treat of automation and controls.

HERE'S CRAFTSMANSHIP

. . . YOU CAN see!

. . . better surface finishes, beveled inner edges, closer tolerances, finest Swedish charcoal iron — plus many other DAROS refinements. Results? Improved sealing, longer wear, and greater fuel economy. Yet, you pay no more for DAROS quality!

Piston Products, Inc. makes sure you get the *right* piston ring for your application. Send for free booklet (left) for practical, field-tested data on selection and application of replacement piston rings in large bore diesel and gas-burning engines.

Inquiries invited from sales representatives

DAROS

PISTON PRODUCTS, INC.
7324 N. Lawndale Ave., Skokie, Ill.

For more information write in No. 9

diesel power

news—people & plants

New Prexy

Billy M. Bittle, Jr. is the fourth president of **Woodward Governor Co.** He succeeds **Irl C. Martin,** who served since 1941.

Billy M. Bittle, Jr.

Drott Purchases

Drott Manufacturing announced the purchase of **Travelift & Engineering.** Drott manufactures front-end loading equipment; Travelift manufactures a line of mobile straddle carriers.

Eastern Manager

General Radiator has appointed **Ole Peterson,** who had been with Continental Motors and Hercules, to eastern Division manager, sales.

Sales Reps

Helon-Lynn McGuffy Co., Ltd. (Canada) have been appointed as sales representatives by **Amot Controls** for their product line.

S/M for Gould

S. A. Bunis has been named sales manager of **Gould Pumps.** With the company for 23 years, he had previously been assistant sales manager.

Three VP's

Perfect Circle has appointed three new vice-presidents: **G. R. Baer,** operations; **A. M. Brenneke,** engineering; and **W. J. Platka,** international.

Mack Manager

Albert G. Crockett has been named general sales manager for **Mack Trucks.** Crockett was formerly director of sales development, and will be assisted in the new post by **Wallace Hallam** and **E. H. Dillow. Theo H. Jones,** Crockett's predecessor, is now southern division manager in Atlanta.

A. G. Crockett

Forms New Division

Mopower Construction Equipment Div. is now a separate division of **Minneapolis-Moline,** for construction equipment. **Bert F. Whitbread** is sales manager of the new division. Tractors, crawlers, and a full line of attachments for highway and building construction constitute the current line.

The complete line for any size diesel . . .

GET SURE STARTS WITH BENDIX® STARTER DRIVES

POSITORK* FRICTION CLUTCH DRIVE HEAVY-DUTY SPRING TYPE FOLO-THRU* RUBBER FOLO-THRU*

Bendix *means* starter drives. Long the leader, Bendix has nearly 50 years of starter drive experience. That's why you can depend on the Bendix name for performance, economy and *sure* starts—for *any* kind of diesel . . . *any* size!

*TRADEMARK

Bendix-Elmira
Eclipse Machine Division
Elmira, New York

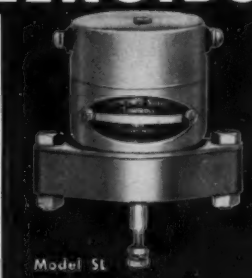
THE Bendix CORPORATION

For more information write in No. 10

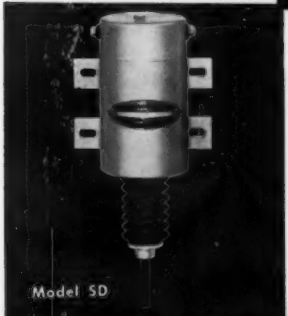
HEAVY DUTY D. C. SOLENOIDS

MODEL SL

VOLTAGES .....(D.C. Only)
6V. 12V. 24V. 32V.
CURRENT DRAW....(Pulling)
55A. 35A. 15A. 12A.
CURRENT DRAW...(Holding)
1.6A. .8A. .4A. .3A.
DUTY .....Continuous
CYCLES..... Not to exceed 6 per minute
PULL...Approximately 10 lbs. over ½ inch stroke
WEIGHT.....2½ pounds



Model SL



Model SD

MODEL SD

VOLTAGES .....(D.C. Only)
12V. 24V. 32V. 115V.
CURRENT DRAW....(Pulling)
40A. 20A. 15A. 4A.
CURRENT DRAW...(Holding)
.5A. .25A. .20A. .05A.
DUTY .....Continuous
CYCLES..... Not to exceed 6 per minute
PULL...Approximately 10 lbs. over 1½ inch stroke
WEIGHT.....4¼ pounds
Model SM available with 1 inch stroke.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVENUE • SKOKIE, ILL.

For more information write in No. 11

KIENE®
DIESEL

INDICATOR VALVES

Furnished with male ½" NPT engine connection. Other threads on order. Adaptations for most diesel locomotive engines.

Kiene valves have effective gas seal both open and closed without packing or glands. Operates against pressure — will never blow open. Small and rugged — 4¼" in length with only 3¼" circle of space for attachments. Kiene valves give better service under the most severe conditions. Standard indicator plug and wing nut connection.

SEND FOR BULLETIN V-10

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

For more information write in No. 12

Cummins Director

Robert A. Cumming has been named Director, engine sales, construction and industrial equipment of **Cummins Engine Co.** Cumming had been in Cummins' Los Angeles regional office, and prior to joining Cummins had been with Caterpillar.

R. A. Cumming

Acquisition

Koppers Company has acquired controlling interest in **Thomas Flexible Coupling Co.** To complement its own coupling Dept., Koppers can now supply engineered service backed by three names in couplings; Fast's, Holset and Thomas. William B. Sawers, Mgr. of Koppers' coupling dept. is also VP of Thomas.

Detroit Diesel Mgr. to Govt. Sales Office

Stanley C. Partel has been named **GM Detroit Diesel's** manager of the Washington office for government sales. **Fay Marvin,** formerly from Detroit, is his assistant.

New Post

H. Neil Worsham has joined **Perfex Corp.** in the new-post Product Manager, Petroleum Industry Div. Also, **Allen A. Bendlin** has been advanced to the position of purchasing agent.

Cuno Names

Donald S. Onnen has been named to the sales engineering division of **Cuno Eng. Corp.** He joins Cuno after five years as chief equipment engineer and operational director of research for NYNH&H railroad.

Garrett Names

John W. Calvert has been named manager of marketing services for the **Garrett Corp.,** directing sales planning, market research and promotion for Garrett and its eight divisions and two subsidiaries.

New VP

Diesel Service Co. has announced that **Robert M. Whelan** has joined the organization as co-owner, and as VP and General Manager. Diesel Service Co. is a warehouse distributor for American Bosch, Robert Bosch, Roosamaster, Bendix Scintilla, and other automative and diesel fuel injection products.

R. M. Whelan

Cat Announces

Caterpillar's manufacturing plant of its subsidiary, Caterpillar France S.A., is in Grenoble. Production of D4's is scheduled for this month. Also, in the U.S., **E. C. Chapman** has been named assistant manager of the company's sales development dept.

Operating Report on:

Detroit's First Diesel Cab

Over two-year's operation proves economy to owners. Here are the facts and figures.

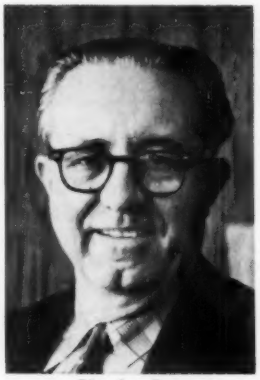
Charles Ross, a cab operator for 38 years, put Detroit's first diesel cab in service on December 10th, 1958. Now, some 92,500 miles later it's still doing fine. Was this pioneering worthwhile? Let's put it this way . . . today, the present firm of Ross & Wildt has 43 more diesel cabs in service on Detroit streets! The fleet consists of 40 Plymouth and two Dodge Dart conversions, all using the Perkins diesel.

The original cab, No. 1360, is a Plymouth with a Perkins P4 diesel installed. It was one of the early conversions made by Ken Brown, Inc., the Detroit organization that has made practically all the Plymouth and Dodge taxi conversions. At the time, Perkins engines for these cabs were supplied by American Diesel Corporation, also of Detroit. David N. Viger, company president, was and is extremely active in promoting taxi dieselization in general and sale of the Perkins conversions in particular.

Since July of 1960, Chrysler Marine and Industrial Engine Division has had responsibility for sales and service of Perkins diesels. For example, they supplied the Perkins P Four 203 diesels installed in the later cabs acquired by Ross & Wildt.

A few months operation of No. 1360 was enough to convince Charlie Ross that he could save money with diesels. Rate of saving was enough to quickly amortize the approximate $800 additional cost for the conversion. This was not a guess . . . it was based on hard, cold records. Daily records on mileage covered, fuel and lube oil used are kept and compiled weekly. Miles per gallon are computed and entered. In a separate book, all repairs and their costs are entered. This is true for every vehicle in the fleet.

Charles Ross told us, "When I saw how things were going, I tried to talk up diesels to other fleet operators. I'd usually get the reaction, 'Well, let's wait a year and see'. At the end of the first year it changed to a two-year wait. Now, it's up to them. No. 1360 is over two years old and the records are there to see. Help yourself."



Charles Ross

Marvin Wildt

Briefing The Records

Marvin Wildt helped dig out figures, running tapes on weekly totals for the 2-year operation. Total mileage came to 92,344. He stated that this conformed quite well to the average Detroit cab operation of about 46,000 to 48,000 miles per year.

Next came a check on fuel consumption. Weekly totals were averaged for the 2-yr period . . . it came to 19.17 mpg. The weekly figures were also examined to see if they revealed any operational pattern, particularly any drop-off in efficiency. First reaction was surprise at the range of weekly averages . . . from as low as 13.5 to a high of 29.0 mpg. However, a definite cyclic pattern keyed to the seasons was noticed. Monthly averages in winter were often 4 to 6 mpg below those for summer months.

Weekly averages within a given month also showed variation. Mr. Wildt explained that this could be due to different drivers as well as type of trips picked up. Get a few trips out to Detroit's airports and it helps a lot.

As to drop-off in efficiency, it's hard to be definitive. Taking the last four weeks in the period and comparing them with the same four of the previous year there is only a drop of 0.2 mpg. Shift a week or two either way and results are quite different, either up or down. The best weekly mileage recorded occurred in the sixth month of operation, the worst in the seventh. All that can be said is that comparing the same months in different years, there is very little, if any, drop-off apparent.

This brings up maintenance. Checking through the records, every item that could conceivably be charged against the engine was picked out and cost tabulated. Total costs were $402.08. Here's a rough breakdown.

There have been no repairs to the engine itself. Three repairs to injection equipment were chargeable. In April, 1960, Nos. 1, 2, and 4 injectors were checked and set, No. 3 was cleaned and adjusted. Cost—$16.69. Later, the diaphragm in the vacuum governor was replaced. Cost—$12.46. Then in September, 1960, Nos. 2, 3 and 4 injectors were checked and adjusted, No. 1 was rebuilt. Cost—$32.00. Total cost for fuel injection for two years—$61.15!

Electrical equipment accounted for the bulk of the maintenance cost. Charles Ross explained that this was one of the early installations and that not all his "pioneering" has been buying the diesel . . . a lot had been in smoothing out the installation. For example, the cab came with a single battery and it soon became apparent this battery with the generator-regulator combination was not up to this type of service.

New batteries plus generator and regulator repair and replacement ate up a lot of the total expenditure. But it was pointed out that this has been straightened out in later conversions. Now two batteries are installed.

There had been some early trouble with the fuel tank and line installation. Also, a section of flexible metal hose in the exhaust line had been replaced twice. Other expenditures were fairly routine in nature—replacement of fan belts, hoses, a thermostat and new battery brackets. At least one item, a $16.69 chunk of the maintenance bill, has nothing to do with trouble but was installed to prevent it.

Warning lights for high water temperature and low lube oil pressure were not felt adequate. Marvin Wildt explained that in all their cabs they were replacing the lights with a good, loud buzzer. Drivers just can't miss it.

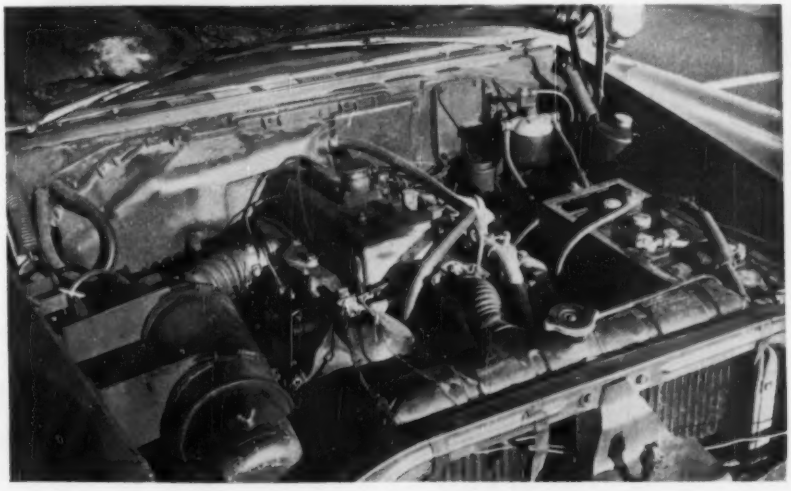
Lube oil and filters are another expensive item. The practice is to change oil every two weeks. This figures close enough for their purposes to a 2000-mile change period. Filters are replaced every other oil change. This is apparently working well as indicated by fuel efficiency and lube oil consumption, both good indicators of engine condition.

In a good many cases, no oil was added between changes. In most of the remaining periods make-up was one quart, and only a few times were two quarts indicated. The "0" "1" and "2" entries were scattered over the 2-year period, showing that oil consumption was a matter of the particular driving conditions rather than result of engine condition.

Savings Are Significant

Performance figures for No. 1360 can be considered conservative. The owners stress that many troubles (and their costs) encountered in this early conversion are not showing up in later cabs. Even so, maintenance and operational costs are running considerably lower than for gasoline engines. Costs for the rest of the vehicle are certainly no higher than for gasoline-powered cabs.

How much can be saved? This will, of course, depend on the specific operating conditions, miles covered and local costs. These factors can be applied to the performance data given. To give an idea, Ross and Wildt figures that the additional $800 paid for the diesel cab is paid off in approximately nine months . . . after that it's a clear saving in operational costs!



Perkins P4 diesel fits comfortably under the hood of the Plymouth. According to data taken from tape covering two years of operation in Detroit taxi service, it took 9-months to amortize the cost premium for diesel. Two years of fuel injection had a total cost of $61.15.

HIGHER PERFORMANCE WITH SMALLER TURBOCHARGERS

AiResearch's new line of high performance turbochargers gives higher air pressures and more flow per size and weight than ever before achieved in the turbocharging industry, while retaining the high standards of durability which AiResearch established in this field.

Designed for the 50-700 hp engine range, the turbochargers incorporate (a) low inertia, low stress, high pressure ratio impellers and turbine wheels, (b) free vortex turbine housings which eliminate nozzle rings and provide higher turbine efficiency.

Other advantages:

Lower Cost—Radically simplified design and high production tooling have significantly lowered unit cost and service requirements.

Faster Response—Lowered inertia of the rotating group has made response almost immediate.

Greater Versatility—Interchangeable compressor components for each basic turbocharger housing permit a perfect matching of turbocharger to the job; and better engine matching further reduces operating cost.

These new, high performance turbochargers are readily adapted to AiResearch turbocharger control systems which insure optimum engine characteristics over the entire range.

World leader in the development and manufacture of lightweight turbomachinery of all types, AiResearch now has more than 35,000 turbochargers in the field delivering nearly 9 million turbocharged horsepower.

Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Industrial Division

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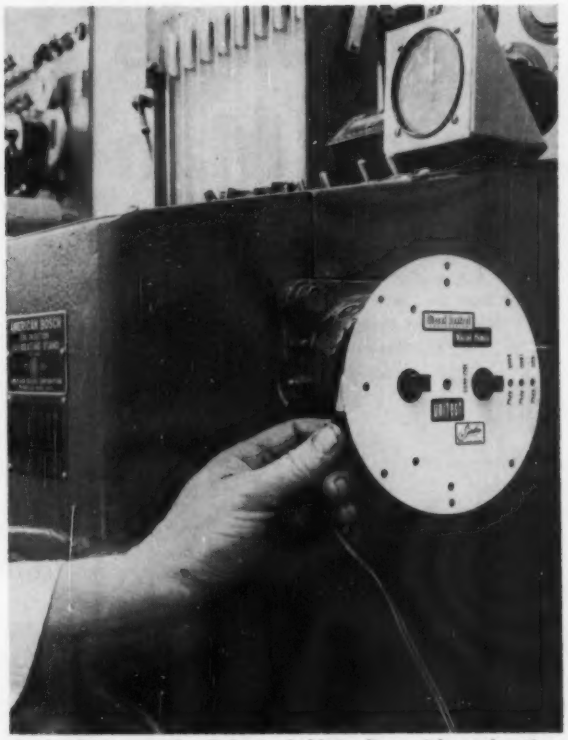
DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND SPECIALIZED INDUSTRIAL PRODUCTS

For more information write in No. 13

Testing the test equipment:

Test Stand Tachometer Accuracy Check



A simple neon tube light is held in line with perforations calculated for test speed, uses line current to check tach.

Tach accuracy is important. A low-cost kit reduces margin for error in fuel injection pump calibration.

Fuel injection pump calibration is only as good as the accuracy of the instruments on the test stand. One instrument that is often overlooked is the tachometer indicating pump-drive speed. Yet Tach errors can affect calibration accuracy. Perhaps one reason the tach is overlooked is the unavailability or cost of having it checked. Now you can do it simply and for low cost.

A simple and inexpensive means of determining the accuracy of this tach is available from Diesel Control Corp., Marine Pump Div. Strobe-Disc, with its accompanying service bulletin, gives you the means and the method to establish absolute rpm at three most-common test speeds.

The "strobe" is a simple light that utilizes the on-off effect of a neon tube plugged into a 60-cycle power source. Any "110" outlet provides this. Light intensity appears to be constant because of the eye's inability to adjust; actually, the light is on-off exactly 60 times per second.

Disc is punched out to mate with standard Oldham coupling, or held in place with a chuck. At certain radii three rows of perforations have been calculated to coincide with 900, 1800 and 2400 rpm pump test-speeds.

To test the tach, disc is set in place on test-stand pump drive coupling half. Pump drive speed is adjusted to test speed as indicated by its own tachometer.

Now, with light behind the spinning perforations for the selected speed and in line with their arc, set the light where bulb appears as a spot of light. Hold it there. If location of the light spot is steady, stand's tach is correct. If light appears to be traveling in the direction of rotation, the tach is slow. If light appears to move counter to rotation, drive speed is lagging behind tach's reading.

Gradually, correct pump-drive speed until light is steady. Take a reading from test-stand tach. Record it. You now have your tach reading for this speed. Repeating the process with the two remaining sets of perforations in the disc gives three points at which actual correct drive speed and indicated speed are known.

A small tach error may be tolerable. If it's borderline, have the tach repaired. However, it's a good idea anyway to check tach periodically against the accuracy of the Strobe-Disc.

Today's Diesel Man . . .

Story and photos by Walter Rudolph

Lewis has a good welding repair program. Says Lewis: "What good is a rebuilt engine if the rest of the equipment fails?"

Milano Construction Co., Erie, Pa., has a catchy slogan: "We Move The Earth." This is very literally what Milano Construction Co. does—they move thousands of tons of it in sewering jobs, road-building, excavating for huge basements of colleges, hospitals, or what-have-you. In the Milano garage on West 26th St., Erie, a dieselman, Ralph Lewis, does a different kind of moving that backs up every field job. Lewis is maintenance chief.

We've known Ralph Lewis for a number of years, followed various Milano jobs for one reason or another, and invariably found Lewis had his hands in on some phase of every job, large or small. Diesel power is what drives the big equipment Milano uses, and Lewis cut his master mechanic's teeth on diesels, ". . . an old Cat 60, in 1936," as he says.

Stopping in the other day, we found the cab, the crawler frame, the Cat 318 diesel power plant, and the rest of a Bucyrus-Erie 22B, ¾-yard backhoe spread all over the 100 by 33 by 20-ft main'enance quarters. Lewis was getting ready to put the head back on the diesel engine.

"We're completely rebuilding this shovel before it goes down to a job in Williamsport, Pa.," said Lewis. "And that includes from the crawlers right on up and over the cab, paint and all. The diesel engine? It had valves ground, valve guides worked on, fuel injector pumps overhauled, pre-combustion chambers cleaned, seals and gaskets replaced, the intake manifold heater tube repaired and cleaned, and so forth.

"My philosophy on diesels is that (and this goes for any mechanical thing), the more PM time you can spend with a machine, the less expensive down-time you're going to have out in the field, where it counts," Lewis continued.

Lewis pointed out one of the things that "kills him . . . ," involving carelessness out in the field. Apparently someone had bypassed the Cuno oil filters on the B-E rig, and put diesel fuel right into the rig's tank, dirty. This meant gumming, sludge, reduced efficiency of the engine's performance, and hastened the day when rebuilding of the engine would have to be done.

"You must have good surveillance in your preventive maintenance program, and cooperation from management, to keep diesel equipment ready, willing and able," Lewis said. "Our program, simply, is keyed by our office timekeeper who keeps a routine sheet on a monthly basis. It tells how many hours the machine has worked, and where it has worked.

"You know, a machine can have a cream-puff job of pushing or digging loose dirt around, or sand, and then it might go to a shale-moving job—in the latter instance, your wearing surfaces and the guts of your diesel have to take about twice or more times as much punishment as in the first place," Lewis said.

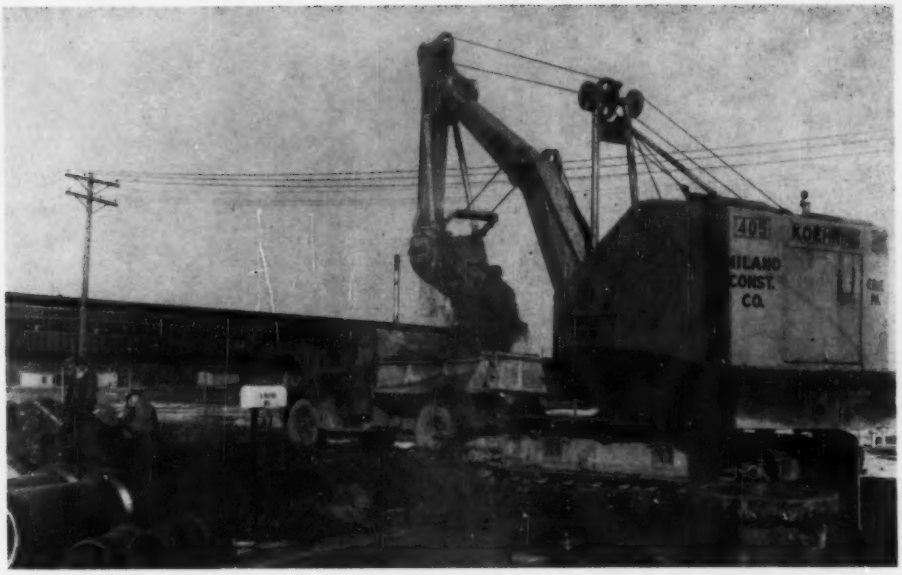
This dieselman is a stickler for manufacturer's recommendations (even though he thinks he can rebuild engines as good or better, at less cost!). Regular maintenance specifications,—plus ". . . whatever we think we need for our operation," is the attitude Lewis takes. When work varies to extremes, your maintenance must follow suit, he says.

Here's the equipment Lewis mothers with nearly a quarter cen'ury of diesel and mechanical experience:

An Adams grader, with Ud-14A International diesel;
Warco grader, with UD-16A International Diesel;
Koehring 304, ¾-yd. shovel, with UD-16A Int. diesel;

Harold S. Clark
President
Milano Constr. Co.

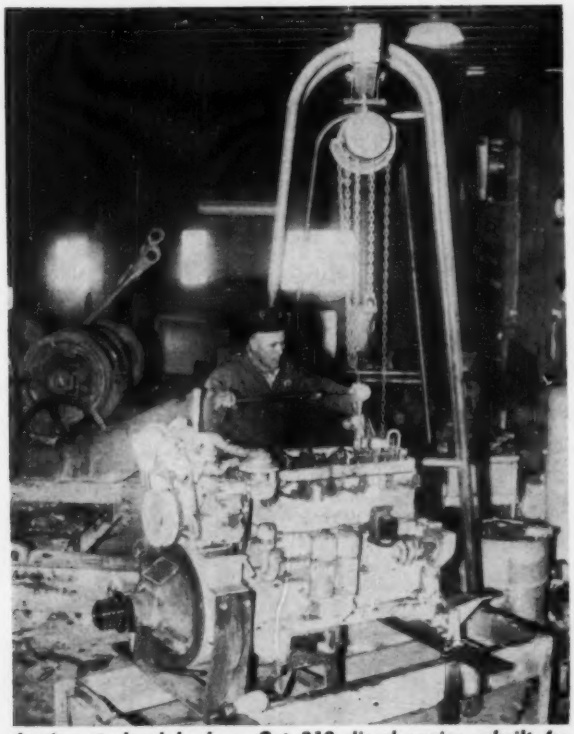
Ralph Lewis is very valuable to our maintenance program, which is left 100% to him. He keeps costs down to a minimum on upkeep of diesel powered equipment. He's especially careful about his pumps, injection systems, etc. He studies all the time; the job is part of him—he likes it like we like pie and ice cream. On replacement parts, he's not tied down. Big purchases we talk over, but he carries the load of responsibility.



Koehring 405 with Cat 318 diesel engine works in a Dunkirk, N. Y. sewering job. Crankcase oil, fuel filtering, lubrication are constantly checked.

Koehring 405, one-yard shovel, with Cat 318 diesel;
Bucyrus-Erie 15B, ½-yard shovel, with Cat 315 diesel;
Bucyrus-Erie 15B, ½-yard shovel, with Buda diesel;
Allis-Chalmers HD6, 1½-yard high lift, AC diesel;
Caterpillar 955, 1½-yard high lift, Cat diesel;
Caterpillar D-7 dozer, with Cat diesel;
Oliver OC-18, dozer, with Hercules diesel.

In Lewis' background of nearly 25 years as a diesel-man, he began working around with many contractors, servicing and maintaining crawlers, tractors, road machinery of all sizes. About 10 years ago he was hired by Milano Construction, and liked what he found: he's been with Milano since, and has helped build up a dollar-saving maintenance program.



Lewis puts head back on Cat 318 diesel engine rebuilt for Bucyrus-Erie 22B unit, also being reassembled in the shop.

We reminded Lewis that one day a year or so ago when he heard of how one operator started reving up a cold high-lift he had sworn that someone should write a book—"This Is What To Do, If You Want to Ruin Diesel Equipment!" Lewis had said, everyone writes about "don'ts" for maintenance, and the "do's" would perhaps give the warning more emphasis by being in reverse. He was pinned down, and gave these "do's" that MAKE WORK for maintenance men on diesels:

DO—bypass your fuel intake filters; buy dirty fuel; use dirty containers to carry diesel fuel around a job—any old bucket will do.

DO—use oil, or any lubricant, beyond the recommended time of the manufacturer; use any lubricant, regardless of specifications.

DO—race a cold diesel engine *before* safe operation temperature is reached; the 16-1 compression ratio means nothing; the engine doesn't need oil clearance if engine is cold and pressure isn't up. Race it.

DO—let your air filter get filthy so no air-fuel mixture is at its best; this helps excessive wear of parts, incomplete burning of diesel fuel—you waste the whole engine, not just oil.

Do—make sure your crankcase air filter is gummed up, too, not working properly. Do ignore warnings of the manufacturer in regard to proper maintenance of little things.

DO—lug your diesel engine (overload it), before proper rpm's are reached, or continue to operate under overload conditions at any time. This knocks out pistons, breaks rings, busts piston heads, and so forth.

DO—let all minor complaints become big ones . . .

(*Continued* on page 35)

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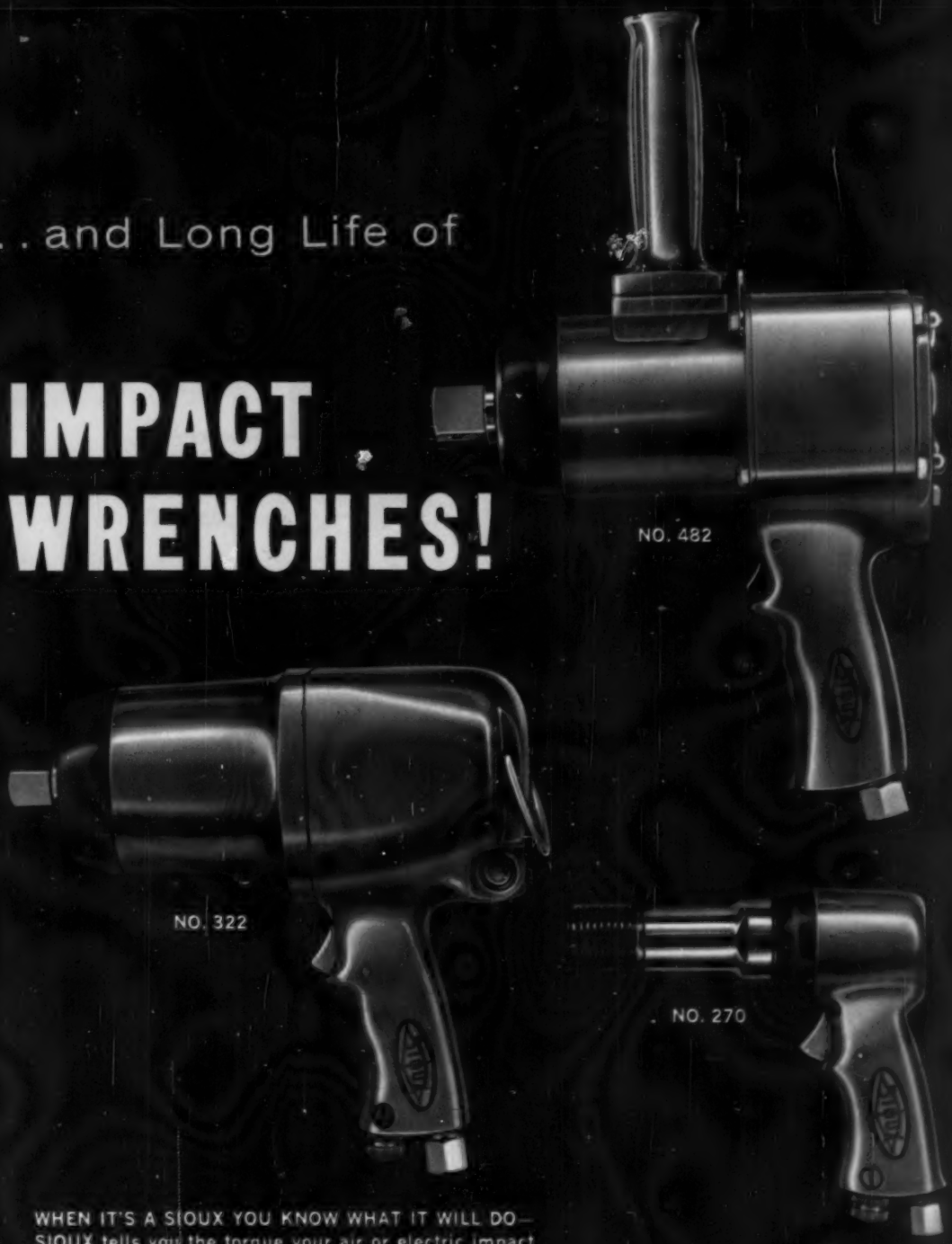

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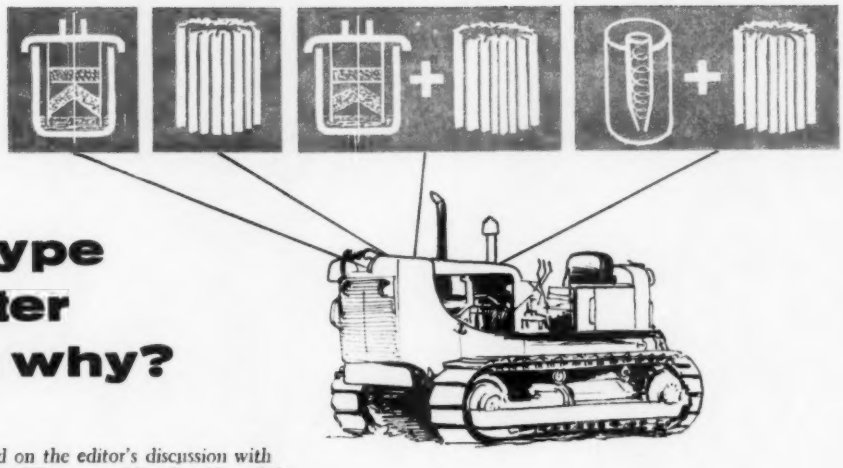


What type air filter and why?

Based on the editor's discussion with
W. B. Watterson, Vice President Sales
The Air Maze Corporation

Air Maze . . . a manufacturer of many types of air cleaning devices . . . contributes factual, objective ideas to help you select the best type filtration for your operation.

Start with the fact that there is one best air-cleaning setup for your *particular engine in your particular service* and under *your particular set of conditions*. Now, what does "best" mean? It does *not* mean that there is one best setup for all situations. It does *not necessarily* mean the best air filtering systems in terms of absolute efficiency. What "best" does mean is the highest average removal of airborne particles possible within the framework of reasonable cost; acceptable service life under existing conditions; space limitations; and other factors peculiar to the given application and operation.

You'll hear a flat statement that any dirt entering the engine with the intake air is bad. While true enough, the statement is unrealistic. What does "any" dirt mean and how "bad" for the engine. How small does a particle have to be before it doesn't bother the engine? What is the effect of the type of dirt? Obviously, there is little sense in dealing in absolutes; we're looking for the best and most practical compromise after considering all the factors involved.

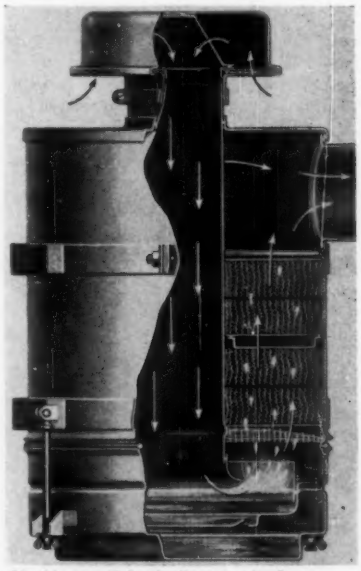
The only way to do this is to know what equipment is available, how it works, its features and also its drawbacks. Purpose of this discussion is to supply basic data for background on which to make a decision. Discussion will cover oil-bath air cleaners, dry-type filters with their various precleaners and combinations of the two.

Oil-Bath Air Cleaners

In principle, oil-bath filters depend on an oil-wetted and oil-washed screen-type element to catch and hold dirt particles until washed into the sump. Reversal of air flow through the oil serves two purposes: (1) heavy dirt particles are inertially thrown out of the air stream, plus the fact that an air-scrubbing action takes place in the oil; and (2) the air flow, carrying oil with it, wets and washes the filtering media.

Let's list some of the "plus" factors for cleaners of this type.

1. First cost is the major cost; only additional is nomi-



Air Maze oil bath directs air downward, through oil, upward through oil-washed mesh, then through oil-removing mesh. Inertia throws dirt out.

nal cost for oil used when servicing, cost for maintenance time.

2. No logistical problem; servicing only requires lube oil of the same type as used in the engine in the recommended viscosity.

3. Self-cleaning with high dirt-holding capacity, giving long life between service periods.

4. Restriction to air flow holds constant between servicing periods.

5. Unit is cleanable indefinitely and cleaning restores original flow restriction.

6. Relatively insensitive to airborne moisture and oil vapors.

Since we're being completely objective let's look at the adverse factors.

1. Efficiency, while in the 97 to 99% bracket at rated air flow, is not as high as for some other types.

2. Efficiency tends to fall off somewhat at reduced air flows as when engine speed drops.

3. No warning is given of ineffective cleaning as can occur at low oil level or excessivee dirt load.

4. Servicing is fairly messy and when done properly takes some time.

These factors apply to oil-bath cleaners as a type and not necessarily to a specific make. Manufacturers are doing their best to produce better designs. For example, we have been quite successful in obtaining good screen wetting and washing at low airflow rates thus minimizing effect of Item 2 in the list of disadvantages. Also, overall efficiencies have been improved.

Dry-type Filters

Cleaners of this type depend on the actual pore size of the filtering media to stop passage of particles in the harmful size range. Resin-impregnated papers of controlled density are the most common media; some prefer a special cloth-type material, stiffened by hardware cloth. Basically, all of these dry-type elements are surface filters.

Now let's look at some of their characteristics, first advantages and then disadvantages.

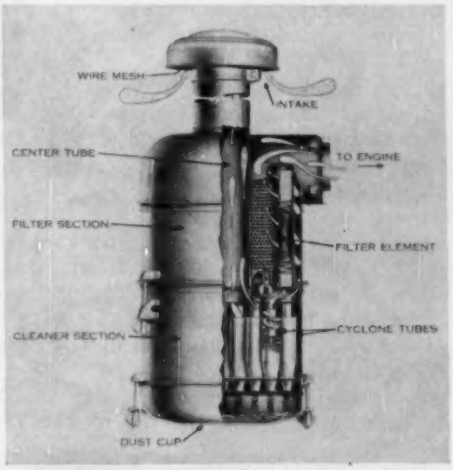
1. They are capable of the highest efficiency of any of the engine filters, some quoted with initial efficiency of 99.9%.

2. Efficiency is maintained relatively constant over the whole air flow range.

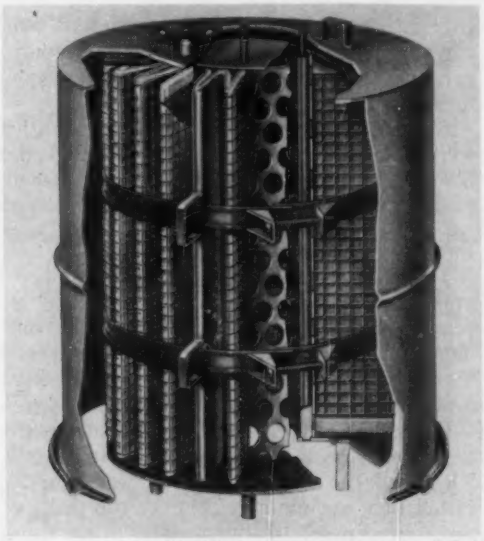
3. Efficiency builds up in service as dirt-cake itself adds to the fineness of filtration.

4. Warns of need for servicing since dirt-buildup adds to air restriction, evidenced by loss of power or engine smoking. (Also, accessory services are available to show increase in pressure drop.)

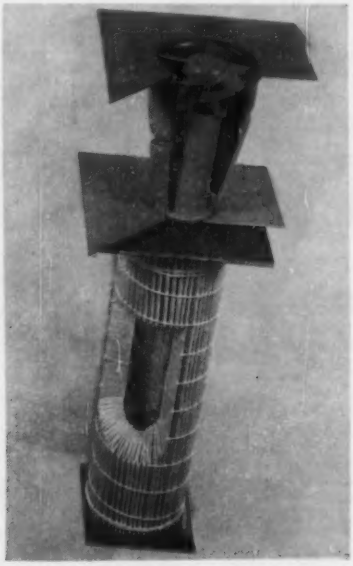
5. Servicing is quick, easy and a relatively clean process.



Donaldson dry-type with cyclonic precleaner reduces dirt load on dry-type element, extending service periods. Flow is downward through tubes, then upward through paper element.



Air Maze dry-type contains fabric element, wire reinforced for strength. It will take several cleanings, resist abusive use for long service life.



Farr cyclonic precleaner plus dry elements stretches service life. Sharp reversal of flow removes big pieces. Engine exhaust aspiration or air bleed provides dirt removal, saving the filter.

Now for some of the negative aspects.

1. Alone, these elements have short service life as they are not self-cleaning except where dirt-cake breaks off due to vibration and gravity.

2. Elements are somewhat fragile, requiring very careful handling during installation and particularly when cleaning.

3. Cleaning, possible for a limited number of times, but in most types of dry media does not restore element to original flow restriction as it is practically impossible to remove fines that are clogged in pores.

4. It is very difficult to detect cracks or breaks that render the element completely ineffective.

5. Size can be a problem since sufficient area must be used to keep unit flow rates low. High flow rates hold dirt to the surface, working against the self-cleaning action and reducing service life between cleanings.

6. Moisture and oil vapor have a tendency to "plaster" dirt onto the surface.

7. There is a logistical problem; the correct replacement element must be available whenever and wherever needed.

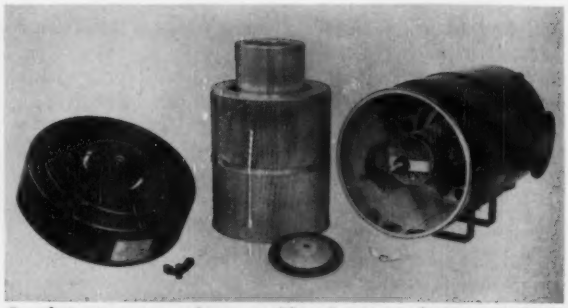
It appears that the dry-type filters have both excellent advantages and serious disadvantages. However, discussion so far has been concerned with the element alone. To get the whole picture, the next subject is . . .

Precleaners

Several types of precleaners have been and are in use with both oil-bath and dry-type filters. In general, their function is to reduce the dirt load on the major filter. One of the most common and oldest is the centrifugal unit with its glass mason jar in which you can see the dirt collected.

These are gradually going out of use, particularly with oil-bath filters. While they do remove a lot of dirt, keeping it from the filter, the violent centrifugal action breaks down many larger particles that are agglomerates into very fine parts. These are difficult to trap in the oil-bath filter with the result that a higher percentage of fine particles get into the engine than would be the case with no precleaner.

Fram dry type filter with precleaner uses pleated paper element in center. Outer element is low-cost synthetic blanket that holds major dirt load, is then thrown away, stretching life of primary element.



Purolator two-stage dry type filter has two elements individually sealed in same housing. Regularly serviced, only outer element needs replacement. If one ruptures, other functions.

One thing these precleaners have done is to make people aware that there *is* dirt in the air. When a tractor operator, for instance, has to empty that bowl three times a day, he *knows* there's dirt there and is more apt to see that major filter servicing is performed. Here's a case where improved servicing practices can result in improved overall efficiency even though the absolute efficiency of the combination unit is lower.

Precleaners can be used effectively with dry-type filters because of the latter's ability to trap all fines down to the limit of pore size. This 2-stage filtration has been used very effectively to overcome some of the serious disadvantages of the dry-type element, particularly its short service life when used alone.

New centrifugal precleaners for use as first stages of dual filtration are much improved over earlier types. Greater centrifugal effects plus sharp directional reversal of air flow removes a high percentage of airborne dirt. Provision is made for dirt removal by an air bleed or engine exhaust aspiration. The low amount of dirt reaching the dry-type element stretches its service life to periods comparable to that of oil-bath filters.

Despite the self-cleaning feature of the cyclonic unit, they are not completely service-free. Dirt buildups occur, particularly where moisture and oil vapors are present, and cleaning is needed to maintain low air flow restriction.

Another type of precleaner is an inexpensive, throwaway "blanket" surrounding the main element. This blanket can be quickly removed when loaded and replaced.

Two-Stage Filtration

Today, people are more aware than ever before of the importance of air filtration. Going a step further, developments in techniques and types has made them more receptive to the idea of 2-stake filtration. By combining features of different types a *better overall result* is obtained.

For example, a damaged dry-type element can give the appearance of good filtration yet in effect is useless. This break can result through careless handling during installation or cleaning . . . or be the result of getting the "screwdriver" treatment. Too often, drivers wanting to make time with a rig that's losing power because of air restriction, will remedy the situation (and ruin

(*Continued on page 40*)

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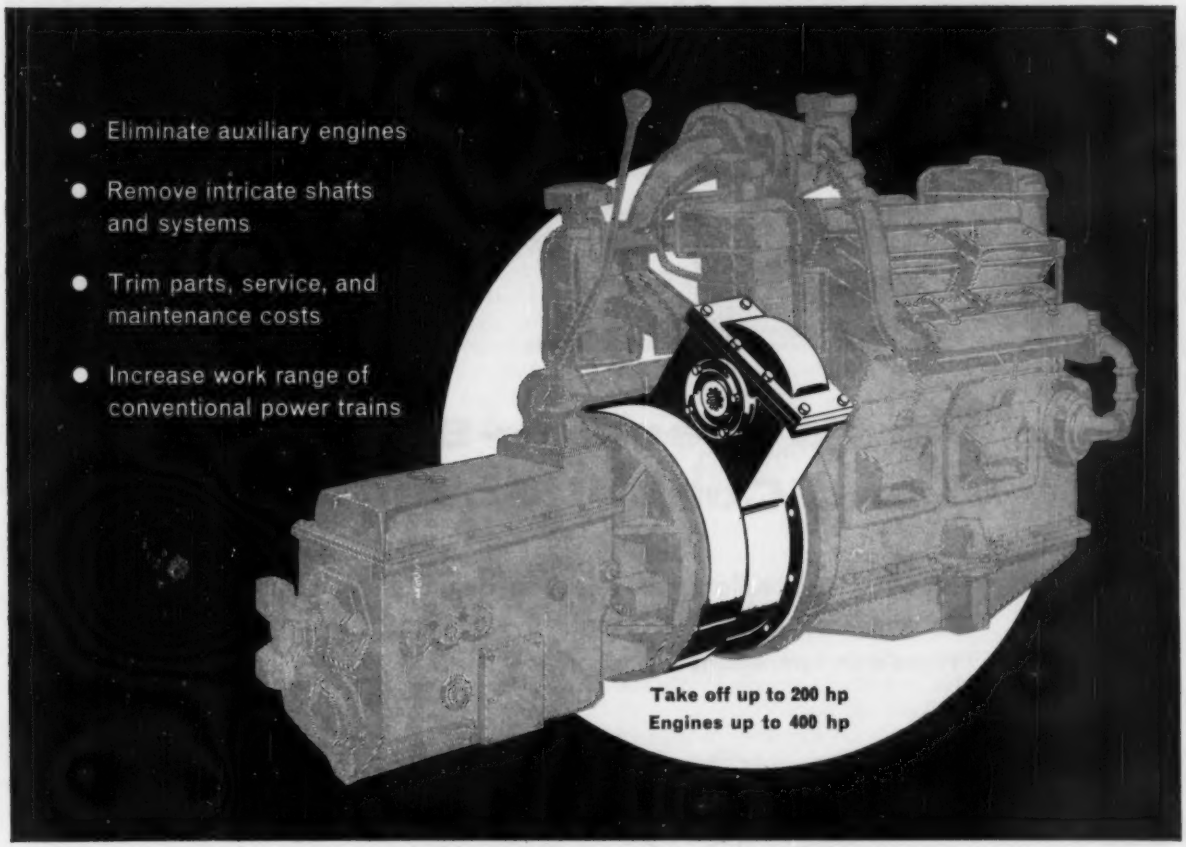
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Woodward's Pressure-Biased Load Control Governor

New Control tailors fuel injection quantity to available air . . . prevents overfueling. Here's an operations report on how it works.

Although speed governing of prime movers dates back nearly 200 years, precise "load control" governing of a turbocharged engine operating under the conditions encountered in rail service is a comparatively recent development.

In basic load control governing, the governor performs the twofold function of maintaining engine speed at a value selected by the operator, and adjusting the load to a predetermined value for each speed setting. Load adjustment is accomplished by regulating the excitation of the generator.

The schematic (Fig. 1) of the governor load control system shows how this load regulating is accomplished Speed setting system in this case is pneumatic-hydraulic (but could have been shown as electric or mechanical) and involves the speed setting pilot valve and servo and elements A, B, and C.

Scale A shows speed setting (down to increase). At extreme right is shown the fuel control rod, an extension of the governor power piston. A second scale indicates its position (up to increase). Lever G is supported at its left end by lever C and at its right end by

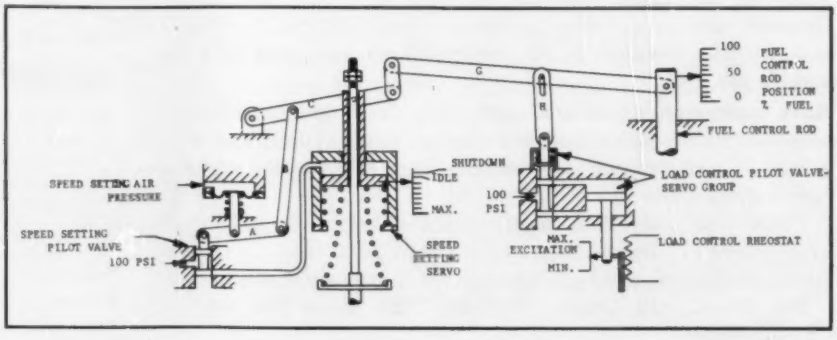

Figure 1
Basic load control applied to Woodward PG Governor

the fuel control rod; its position therefore is a function of both speed setting and governor power piston position or fuel setting.

The load control pilot valve plunger is suspended from an intermediate point on lever G and serves to control position of the load control servo. When the pilot valve is in a centered position the load control is stationary, thereby neither increasing nor decreasing the load. When the pilot valve is above center, the load control servo moves downward, decreasing the load; and conversely, when the pilot valve is below center, the servo moves upward, increasing the load.

An examination of Fig. 2 will show that for each speed setting there is only one fuel setting which will result in a centered pilot valve and a stationary load control servo or constant load. Lever G and pilot valve-servo group therefore dictate engine load and fuel setting for each governor speed setting. A load control curve as shown in Fig. 3 is produced by this governor.

This system has worked well with thousands of naturally-aspirated and gear-driven supercharged engines. Proper engine and blower design provide sufficient air for combustion, and the governor maintains desired load and fuel setting for any speed setting. A point to remember is that during engine accelerations the positive gear-driven blower provides air for combustion instantly.

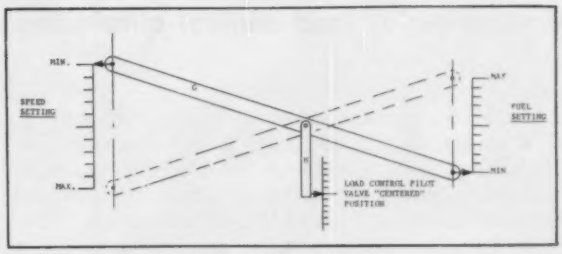

Figure 2
Load control linkage

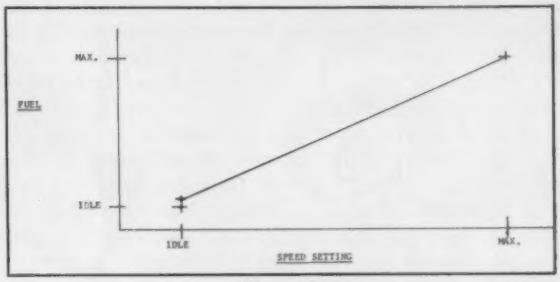

Figure 3
Basic load control curve with Woodward PG governor

Inertia Presents A Problem . . .

With the advent of the turbocharged engine this is no longer true. The exhaust gas-driven supercharger has inertia, and having no positive mechanical drive from the engine, tends to lag or fall behind the engine during accelerations. A deficiency in combustion air results and improper combustion occurs.

The General Motors engine referred to in this article uses a combination gear-driven supercharger and exhaust gas-driven turbocharger. At low speeds the supercharger is gear-driven directly from the engine. At higher speeds, energy in the exhaust gases increases to a point where the exhaust turbine, through an overrunning clutch, takes the blower drive away from the gear train. In this system, turbocharger lag is possible only at the higher speeds when the blower is turbine-driven.

The "pressure-bias load control" was developed to eliminate difficulties resulting from this turbocharger lag; specifically, to match fuel supplied to the engine to actual combustion air available. This system produces a load-control curve which is dependent upon fuel and speed as shown in Fig. 3, and thirdly, upon the weight of air which is available for combustion at any instant.

A schematic of the pressure-bias load control system is shown in Fig. 4. The combustion air factor is intro-

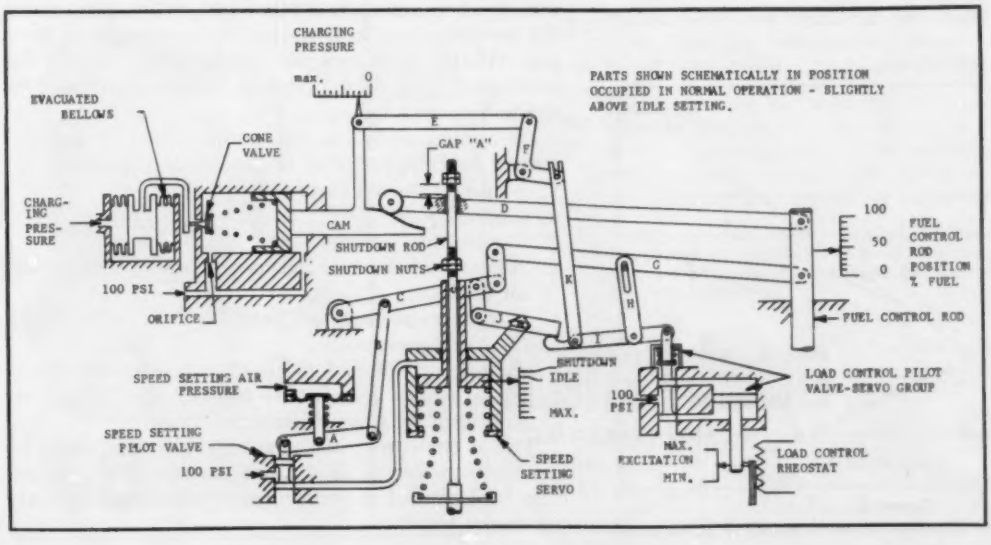

Figure 4
Pressure bias load control and fuel limiter applied to Woodward PG governor.

duced by the pressure sensor and linkage elements E, F, K and I. It was theorized that turbocharger air-discharge pressure would be a measure of air availability accurate enough for governing purposes. Subsequent tests have proved validity of this assumption.

Air-discharge pressure from the turbocharger is brought into the sensing bellows at the point marked "charging pressure" and through a force-balance system is converted into output-cam position. An evacuated-bellows opposing the sensing-bellows causes the cam position to be a function of *absolute* charging pressure. Through elements E, F, K and I, the pressure-sensor is able to alter, or bias, the position of the load control pilot valve plunger relative to lever G. Fig. 5 illustrates effect of this re-positioning of the pilot valve. Assume that with no supercharger an engine is capable of working along a load control curve such as AB. Assume also that the addition of a turbocharger permits burning of more fuel and a load control curve such as CD.

It will be noticed that lever I (Fig. 4) has been interposed between link H and the pilot valve. Its left end is positioned in proportion to the absolute pressure of the turbocharger discharge. If curve AB is set up with no air being pumped by the turbocharger, then as the turbocharger comes up in speed and pressure and lever I moves through its stroke, proper proportioning will cause lever I to shift the curve to CD.

It is possible that under certain conditions turbocharger pressure could be great enough to raise the load control curve to an excessive value of load. To prevent this occurrence, Lever J (Fig. 4), operated by the speed setting group, sets an upper limit to the load control curve for each speed setting.

If the engine is operating normally at point X (Fig. 5), and it is desired to increase the load to point Z, the following could happen:

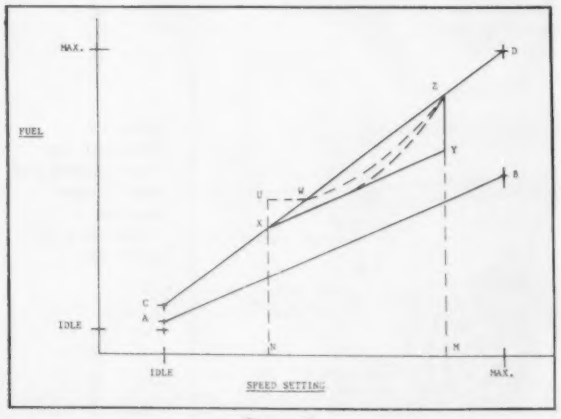

Figure 5
Pressure bias load control curves

1. If the speed could be changed instantly from N to M, the load control system would move the control point from X to Y. Acceleration of the turbocharger then will shift lever I, lower the load control pilot valve, and increase the load so that the system will stabilize at point Z.
2. On normal acceleration it is possible that the dotted curve from X to Z would be followed since charging pressure lags engine speed a little.
3. During steady-state operation an excess of air is normally available at all points. For instance, if the engine is operating at X, there may be enough excess air to run at "U", but is prevented from doing so by lever J. Then, on an acceleration to "M", the control would go from X to W and then proceed along a curve to Z.

Built-in Safety Features . . .

It will be seen that the system provides a number of safety features. In case of a defective turbocharger, the device will cut back load to match the air available. In the case of high altitudes or reduction in available air in tunnels, the device matches load to available air. Primary function of the pressure-bias load control, of course, is to continuously adjust load and fuel setting to match available combustion air.

On large fast transients, such as advancing the speed control quickly from idle to full speed, there are times when the governor power piston may have a tendency to overtravel for brief periods before the load control system can stabilize. This is prevented by means of a positive fuel limiter, which, for each turbocharger discharge pressure, places an absolute limit to the maximum fuel setting which the governor can reach.

Linkage to accomplish this limiting is shown in Fig. 4 and is composed of the pressure-sensor cam and element D. Left end of element D is positioned by the cam, and the right end is actuated by the fuel control rod. If, even momentarily, the fuel setting goes above the instantaneous load control curve enough to close gap "A", the shutdown rod will be lifted, causing the main pilot valve to stop further upward movement of the fuel control rod.

In normal operation the various devices just described function together in a well-integrated unit to:

1. Maintain desired speed.
2. Control load.
3. Control fuel setting.
4. Adjust load and fuel setting on basis of combustion air available.
5. Provide maximum fuel limit for each turbocharger discharge pressure.
6. Provide maximum fuel limit for each speed setting.
7. Reduce load in event of turbocharger failure, resulting in decrease of combustion air.

This is the theory of the system, but the payoff, of course, is performance in service where the pressure-bias load control is really proving its worth regularly for the railroad.

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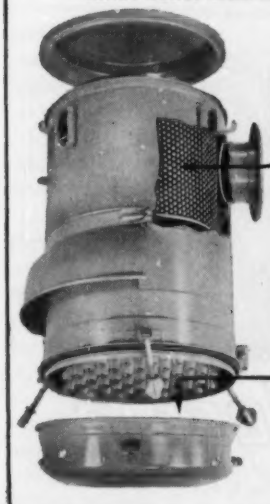

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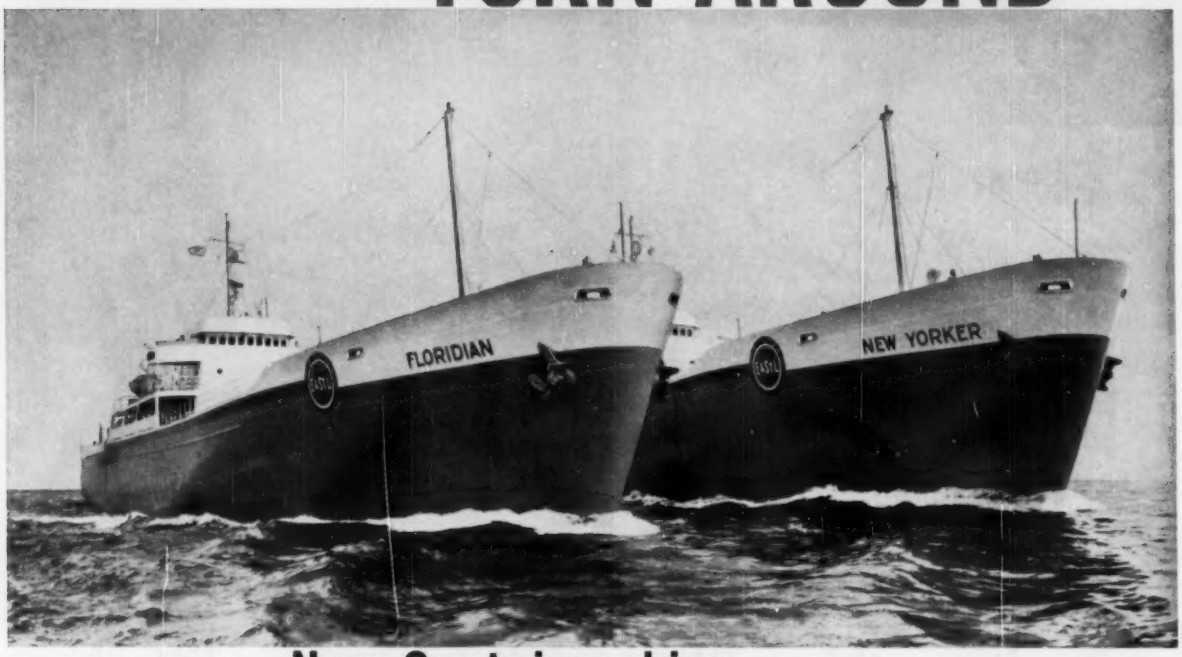

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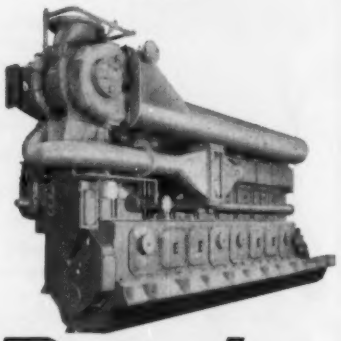

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"This is one of our biggest and best rigs. We've had it in operation . . . virtually without stop since 1947.

Coastal drilling's 13 year old "Jimmies"

Dieselman Al Earnshaw credits long engine life to careful PM . . . and proper engine rating.

How would you describe this drilling rig with the 100,000-hr "Jimmies," Al?

It's a portable rig purchased new and first placed in operation Aug. 1, 1947. It had three GM 6-71 quads and one pair of GM 6-71 twins—all were new.

The three sets of quads are used to drive the rotary table and a Gardner Denver mud pump. The pair of twins operate the rig's mixing pump.

All engines are fitted with GM 60 injectors and operate on automotive diesel fuel. No modifications were made to the engines before placing them on the rig.

When was the first time that anything was done to any of these diesels?

About a year after we purchased the rig—maybe less—we had to replace all the pistons and rings. We had had trouble with the engines during that first year and felt the new style pistons and new rings would clear up this trouble. At the same time we replaced the liners.

What has been done to those engines since that time, Al? Are all these engines still on the same rig?

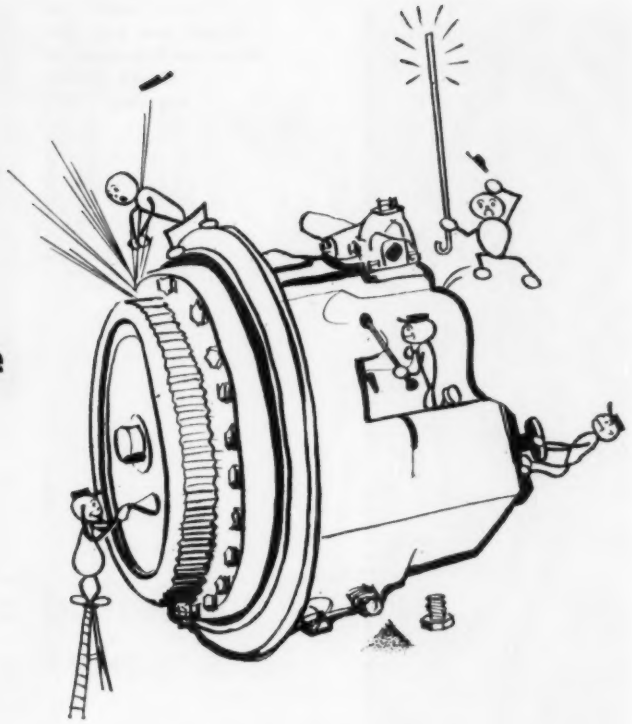
Yes, these engines have never left the rig. For the first seven years, I was the rig mechanic. That meant that I was in personal charge of everything that was done to those engines.

The heads have been off all the engines and by now all the valves have been replaced. Several engines still have the original heads. Eight of the Jimmies have their original rods, bearings and wrist pins. All of them have the pistons, rings and liners that were installed back in 1948. Twelve of the engines have their original cam-

(*Continued on page 40*)

EDITOR'S NOTE: DIESEL POWER readers will remember Al Earnshaw—he was our Dieselman for March, 1960. He's responsible for five oil drilling rigs and over 100 diesels out in Bakersfield, Calif. Our March story told how 12 of Al Earnshaw's General Motor's diesels on one rig had "operated for 100,000 hours before major rebuilding." We carefully checked those figures with the management at that time—and they were re-confirmed. Or course, as we expected, we got a lot of letters on this story. That's why we decided to pay another visit to Al Earnshaw. Readers have indicated that they'd like him to spell-out exactly what he meant by "major rebuilding" and how his Jimmies achieved this remarkable record. We found Al willing—even anxious—to amplify his remarks about the engines. Matter of fact, he observed that he probably wouldn't have believed such a statement himself—"100,000 hours without major rebuilding"—no matter where he read it.

Before you Blame the Converter . . .



COUNT TO 10

By G. A. Limbach, Sales Manager, Industrial Products Clark Equipment Company Automotive Division

Some time back a service man drove several hundred miles to service a torque converter on a barge crane in the lower Mississippi Delta. Initial investigation indicated no torque converter troubles. The superintendent, however, insisted on having the converter torn down completely so he could inspect every part. Still there was nothing wrong with the converter. It took two and one-half days to persuade the superintendent to call in an engine mechanic, who quickly found that the fuel rack was not adjusted properly.

Two men walked into a converter manufacturer's plant to complain that for seven months the torque converter on their shovel had been acting up and no one could help them. A quick check showed the output shaft governor was bad, and the engine mechanic was called. The unit is working very well now.

A torque converter manufacturer recently was asked to send a man to Nevada to investigate a faulty converter. Indications were that nothing was wrong with the converter. To satisfy the customer a major shovel manufacturer sent a top flight engineer from the manufacturer's Middle Western plant to check the unit. He found the injectors on the engine were fouled. The converter was blameless.

A torque converter man can go on like this for hours. So many times a service call report can be written "the same old story".

Simple Design—Little Trouble

A torque converter is basically a simple machine—there are very few rotating parts, and they all roll in the same direction. There's a pump, a case, some fixed parts, seals, bearings, and perhaps a simple valve, plus a heat exchanger. There is not very much to go wrong. If a converter has pressure, is not running hot, and doesn't have any grinding noises or rattles from an internal failure, the chances are excellent there is nothing wrong with it.

Of course, a torque converter is not indestructible. When power train trouble does arise in the converter, it is generally found to be one of two types:

1) It's a leak. This is a common complaint but is not serious. The remedy is usually replacement of "O" rings, gaskets, seals, or other minor components.

2) The bearings are shot. This may be serious and never should be permitted to develop to an advanced stage. Remedy is replacement of bearings. If operation with a failed bearing or bearings is continued for long, a major repair will become necessary—if continued to the point where the converter "cleans house" a new unit might be the cheapest way out! Prevention is simple common-sense care: if the converter growls, look for a faulty bearing and replace it immediately—before the damage spreads.

A converter must be carefully matched to an engine

to give satisfactory output characteristics. In many ways it's like a centrifugal pump. If you increase the engine rpm a little, the output increases a lot. In another sense, the converter is like a dynamometer, and it can be used to check engine output.

Stall Converter For Check

All torque converters, to some extent, load the engine when they are working. Since the converter output speeds vary so much while it is working, it is difficult to make a working check on the engine. Most machines, however, can have the output shaft of the converter locked, braked, or loaded to the point where it will not turn even when the engine is run wide open. This is most often called a "converter stall" condition. A converter stall check consists in taking the engine rpm reading with the engine running wide open and the converter stalled.

Many manufacturers put a placard on their machines indicating stall check rpm. It is wise for anyone running a torque converter equipped machine to get a good reading of the engine rpm at stall for future reference. This should be taken under good conditions when unit is operating satisfactorily.

It is obvious if a machine is moved to a very high elevation where engine horsepower falls off, or if the engine becomes out of tune, or the governor setting falls off, or any other change in the engine occurs, the converter stall check will show an engine rpm below what it should be. Since a small input rpm drop can greatly affect the output of a converter, poor performance will result. If a stall check shows a significant fall off of engine rpm, call an engine serviceman. (Care must be taken not to run the engine at full speed too long in the stall check, because all of the engine power is going to heat in the converter, and over-heating can result.)

Torque Converter Tips

Before you pull out the torque converter for service, check these 10 points with gages and tachometers of known reliability.

1. Check torque converter pressure.
2. Check torque converter temperature.
3. Check oil level in converter.
4. Check oil against recommended type.
5. Check for metal particles on magnetic plug and in filters and strainers, and check for noise.
6. Make a stall check
7. Check output shaft governor for proper operation.
8. Check engine governed speed at no load.
9. Check the machine itself for binds and other causes for subnormal operation.
10. Check the operator's technique.

If checks one through five are satisfactory, the converter is probably working satisfactorily. If checks six through ten are also satisfactory, then your machine's poor operation should be reported to your machinery dealer for further investigation.

Today's Diesel Man . . .

(*Continued from page 21*)

Lewis' welding repair program "keeps the equipment on the job". Here, crack on scoop from shovel loader is repaired.

so it costs more to correct troubles, and there is lots of down-time on an important job.

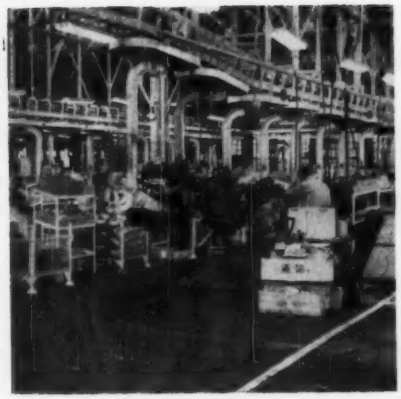
"These items are another way to say, 'If the company doesn't work, you don't work,' which is forgotten by field operators of equipment in the hustle and bustle of work," stressed Lewis.

(It's interesting to note that this dieselman is a chief marine engineer, 658th Floating Craft Co., U. S. Army Reserve, with 20 years service record; Erie is in the 21st Corps area. There is plenty of diesel experienc to gain in this category, Lewis remarked.)

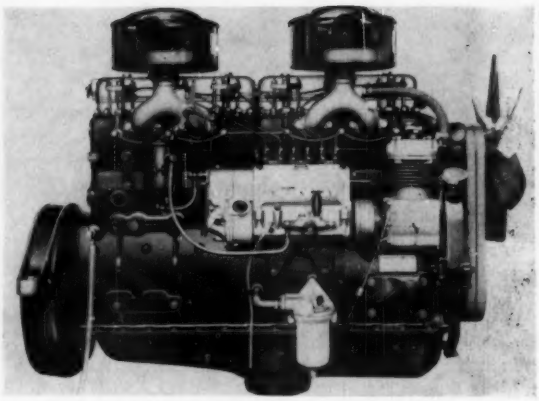
Finally, not the least important to a dieselman's job is the equipment into which diesel power goes, Lewis said. He has instituted many maintenance and repair steps built around skilled welding, either hired or done right in the shop. He has helped build or had built many aids to shop work, such as the gantry crane, benches, racks, brackets, tool holders, etc.

Dieselmen should never stop learning, he believes, and bears out this credo in his everyday attention to details.

New Allis-Chalmers 1½-ton high-lift went into action last summer for Milano Construction. As part of routine procedure, timekeeper has record of hours, conditions, etc.



Isuzu factory uses modern western techniques in huge factory that produces bulk of domestically-used diesel engines. Workers are skilled, induced to stay by guaranteed life employment, hospitalization and bonuses. Right: DH-100 engine rated 190-hp. Others span from 52 to 230-hp.



Isuzu Enters U. S. Market

One of Japan's leading diesel engine producers offers small to medium-size engine line here

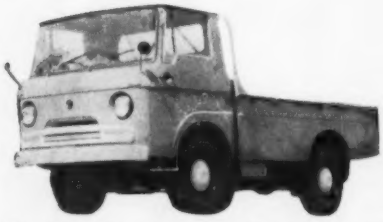
At this time, Isuzu is showing only the engines, but the plant produces a complete line of trucks and some diesel-powered construction equipment for home use.

At San Francisco's Truck, Trailer and Equipment Show, American diesel users will see a line of Japanese diesel engines representing a bid for a share of the American market.

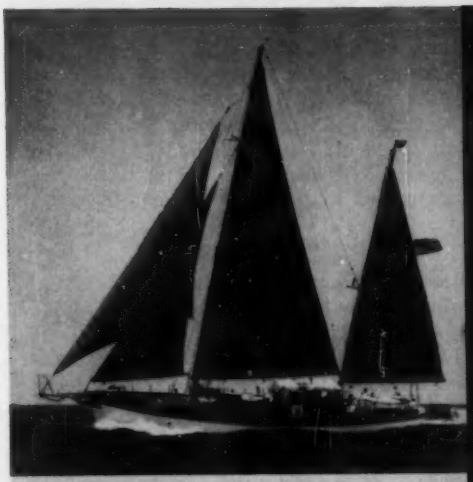
Isuzu Motor Co. Ltd. has been making diesel engines for 25 years. Today, they market a line ranging from their DL-200 (120-cu in., 4-cyl, 52-hp) to their 230-hp DH-100 T. Other engines are available at power ratings in between, supercharged or naturally aspirated.

Location picked for the initial showing is significant because Isuzu also makes a diesel vehicle line. Truck line spans from 8-ton (payload) capacity models to a 2-ton "Elf" line for light commercial use. Buses, construction and farm tractor models are also offered, with an all-wheel-drive truck already in use by the U. S. Army in Japan. Isuzu produces more than 50% of diesel truck and more than 40% of diesel buses for the home market. Modern mass-production techniques combined with skilled manpower are used.

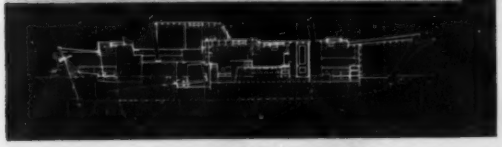
Now, Isuzu is in the American market with a line of low and medium-size engines. The light and medium-size truck line may not be far behind.



Small 86-in wheelbase diesel-powered open van (above) is for light commercial use. Rear-engined diesel-powered turnpike-cruiser (right) is an 81 seater, available in Japan as air or spring suspension.



"OCEAN PEARL" Designer: F. Spaulding Dunbar; Builder: G. DeVries Lentsch, Jr.; Owner: J. Seward Johnson; L.o.a., 62′ 6″; L.w.l., 55′ 6″; Beam, 16′ 0″; Draft, 4′ 2″; S.A., 1900 feet; Displ., 105,000 lbs.; Power, two Mercedes-Benz Model OM 321 95 HP diesel engines—Photograph by M. Rosenfeld.



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Mercedes-Benz diesel engines set the standard at sea for dependable performance. Each one is the product of over 70 years of development and refinement.

"Our Mercedes-Benz OM-321 Engines have continued to give untroubled performance since they were installed in Holland...four years ago.

"Since then, we have cruised across the ocean via the Canary and West Indies Islands and have made about five trips from the Bahamas via Florida and New York to New Brunswick, Canada.

"The OCEAN PEARL has never been out of commission and our stops in the boatyards have only been long enough to put on a new coat of paint and fitout for the next trip."

Commendations such as this one from Mr. J. Seward Johnson, owner of the OCEAN PEARL, are a typical response from yachtsmen the world over. Boat owners who demand the finest find that demand best met by Mercedes-Benz engines.

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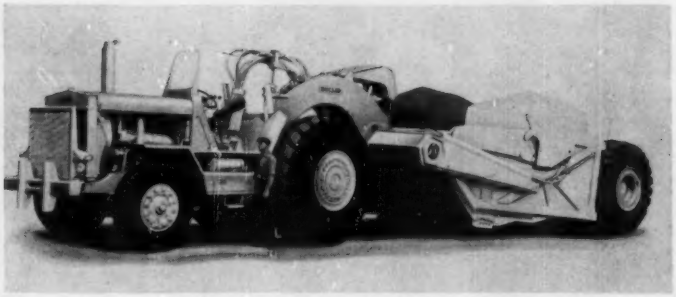
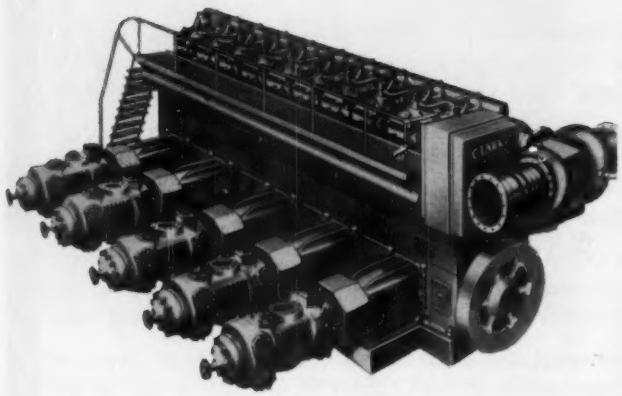


Euclid's Largest Scraper

GM's Euclid Div. announces its largest scraper—model SS40 six-wheeler. Payload is 125,000-lb; struck capacity 40-yd with SAE rating 52-yd. Designed for high-production jobs with long high-speed hauls at up to 34-mph, power is GM-12V-71 diesel engine rated 432-hp. Equipment includes Allison Torqmatic drive with four forward and two reverse speed ranges, full power shaft. Converter lock-up is incorporated into converter-transmission package. Torqmatic brake, a hydraulic speed retarder to control speed on long downgrades, is standard equipment. Engine and transmission oil filters, and dry-type cleaners are located for fast, easy servicing.

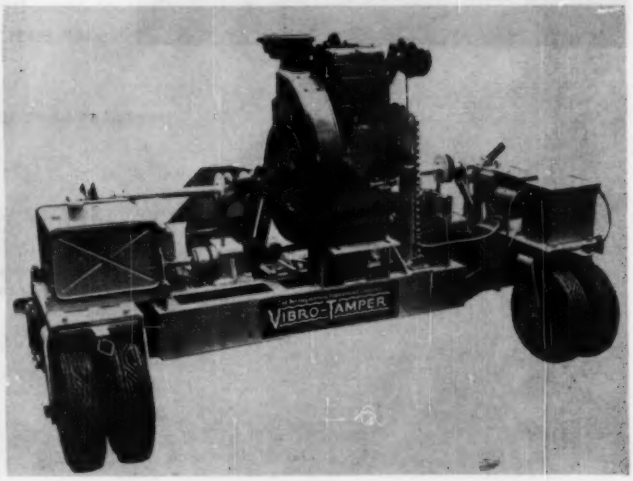


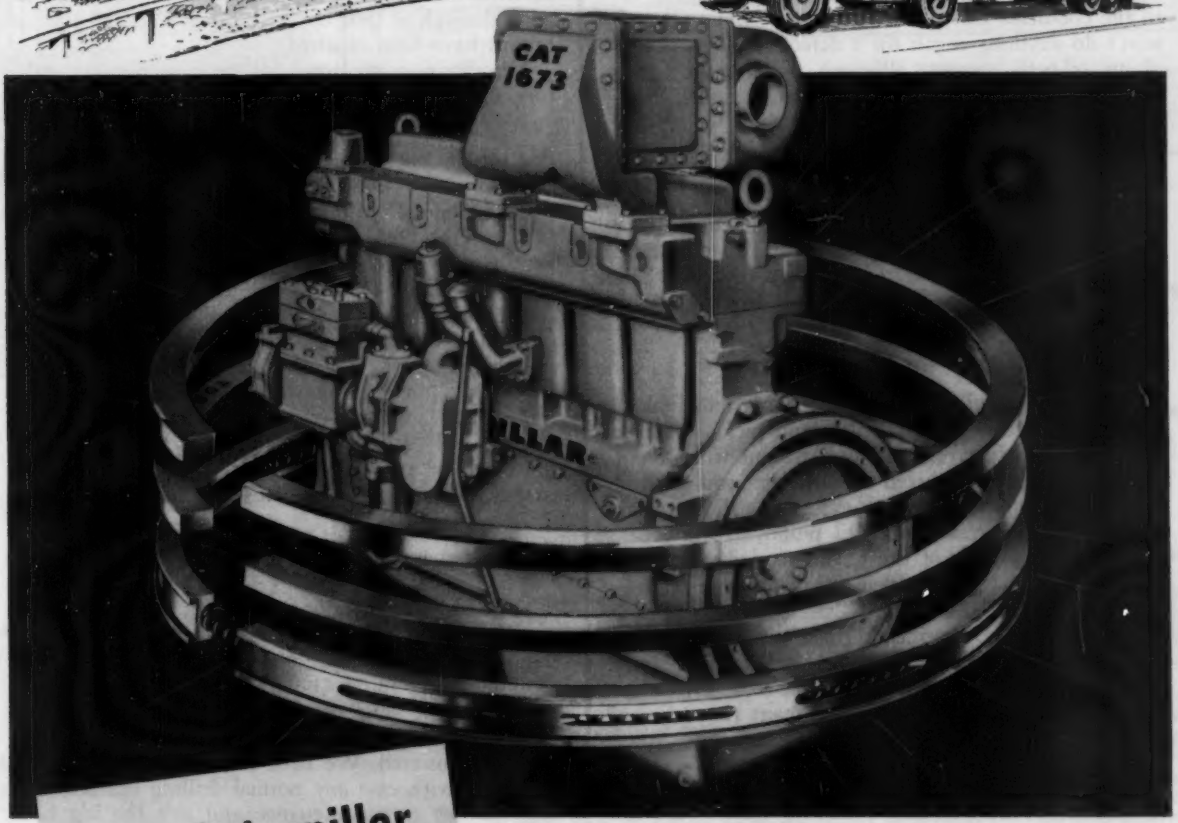
Clark Bros. Introduce Modified TLA Gas-Engine-Driven Angle Compressor

Clark Bros. has developed a modified version of its model TLA gas-engine-driven compressors for the 1500-3000-bhp range. This series is designated model TBA, and will supplement the TLA line in intermediate horsepower steps. Bore and stroke is 17-in x 17-in, built in 5, 6, 8 and 10-cyl models rated 1500, 1800, 2400 and 3000-bhp respectively. These sizes combined with the TLA units (rated 1700, 2000, 2800 and 3400-bhp) offer a full range of models for pipeline and processing requirements. New TBA line's operating characteristics are the same as TLA line's in every way.

Diesel-Powered Vibration Tamper

With the Federal Highway Program getting back into high gear (after slipping into neutral for a while) International Vibration Company's model J4 Vibro-Tamper is ready to step in. Four vibrating shoes of 450-lb each provide a total ground contact area of 1344-sq in., delivering 2200 blows per minute. Working width of the unit is 8-ft 6-in. Power source is a Lister air-cooled diesel engine, model HB2, developing 24-hp (continuous) @ 2000-rpm. For this application, working parts of the engine are totally enclosed for protection.





New Caterpillar® 1673 Diesel Truck Engine

EQUIPPED WITH

PERFECT CIRCLE CHROME PISTON RINGS

Based on a design proved in thousands of diesel engines in the field, Caterpillar's new 220 horsepower 1673 Diesel Truck Engine combines a precombustion fuel system, turbocharging and aftercooling for outstanding performance and economy.

The precombustion chamber assures full burning of fuel at all load conditions, utilizing a large single orifice that prevents fouling and makes possible the use of less expensive fuels.

By cooling the air of this turbocharged engine with an aftercooler, the power of the 1673 is increased significantly.

To deliver top power and oil control in each of the 6 cylinders, Caterpillar employs Perfect Circle piston rings on an aluminum-alloy piston with cast iron top ring groove. These rings were developed jointly by Caterpillar and Perfect Circle engineers and performance proved in extensive tests on Caterpillar Engines.

The long-wearing M-alloy iron top ring is plated with thick, solid chrome for protection against high-compression wear, scuffing and scoring. The oil ring, with tempered steel coil spring, is specially designed for lasting face unit pressure and nonclogging performance.

To get top performance when reconditioning your Caterpillar Engines, see your Caterpillar Dealer for replacement piston rings

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For more information write in No. 18

Air Filter Selection

(*Continued from page 26*)

an engine) by making a hole in the element.

A good precleaner, by stretching out the time until the condition exists, will go far to eliminate this. It won't do anything much for a defective element. Use of an oil-bath cleaner, although absolute efficiency might be lower, would give better overall results.

Going a step further, 2-stage filtration, combining the oil-bath type with its high dirt-holding capacity and long service life with a dry-type element with its high efficiency would produce excellent results and insure a high degree of air filtration at all times. By all means consider the possibility of combinations that can best meet your particular requirements, not overlooking the practical aspects that have nothing to do with the filters themselves.

Sizing is Important

Don't kid yourself on filter sizing. First let's look at costs. No matter what type filter you pick, a smaller size will probably save a few dollars. But what about later costs? In an undersized oil-bath filter you sacrifice dirt-holding capacity, get into excessive airflow velocities with higher restriction. Oil pull-over can occur, even when using oils of the recommended viscosities.

One effect of high flow velocity in dry-type filters—holding dirt on the surface—has been mentioned. Service life is also sacrificed. Relationship of service life to surface area for a given air flow is not directly proportional. If you double the surface area, service life is not only doubled but is increased many times. So an undersized element can run you into high later costs for servicing and element replacement.

Where space for the filter is the governing factor (and designers often seem to forget the filter's space requirements) you'll be better off picking a filter of the proper flow rating that will fit, regardless of its type or relative efficiency. You'll get a more satisfactory installation and better overall efficiency.

In Summary

There can be no argument about the need for good air cleaning. Both oil-bath and dry-type filters have good points and bad points. It is important that these be known and considered. Use of precleaners with dry-types or use of both filter types in combination alters some characteristics of the filters when used alone. Two-stage filtration, then, should also be considered.

Take practical factors into account . . . costs . . . maintenance practices . . . psychological factors . . . operator habits. If adverse, these can defeat the best possible filter application. Where one or more of these factors cannot be controlled, it could very well dictate the type of equipment selected so as to obtain best overall results under existing conditions.

Remember one thing you're not dealing in absolutes; you're trying to arrive at the best compromise—to get the engine protection you need at the least practical cost—in terms of your particular operation. Your engine will tell you if you don't succeed.

Al Earnshaw

(*Continued from page 33*)

shafts. To the best of my knowledge all of them have gone through at least one water pump and all the fuel pumps have been repaired.

Miscellaneous replacements such as blowers, injectors, etc., have also been made.

How steadily has this particular driller rig been in use since 1948?

This is one of our biggest and best rigs. We've had it in operation, both in California and in the mid-continent area, virtually without stop since 1947!

In the process of drilling an oil well, these engines run night and day. They're only shut down for servicing and repairs and will sometimes never get cool for six months.

Over 50% of the time we run these engines at 1875-rpm. This is when we're making top hole—down, say, to 6000 feet or so. Below that point the engines will run at about 1300-rpm and will oftentimes be run at as low as 600 to 700-rpms' for several days at a time.

Can you describe the average conditions under which these engines operate?

Normally they will operate under pretty favorable conditions. Sometimes it will get dusty and frequently the ambient temperature around the engines will rise to as much as 140°F, but generally the temperature range and the dust conditions would be considered normal. The rig is well powered. By that I mean it is not underpowered. We have enough engines on there to handle with ease any normal drilling operations.

I'm a bug on maintenance and so's the big boss, Charlie Whitney. We make damn certain that the engines are completely serviced once every seven days and that the air filters are changed once every 14-days. We don't accept excuses for improper servicing.

Summarizing what you and the rig's present mechanic, Mat Humecky have said, we can then say that all 14 of the GM 6-71's on this rig have been in nearly continuous operation since 1948? That the pistons, rings and liners in all of them are those that you originally installed in 1948 and that the bearings in eight of these engines are the original bearings dating back to 1947? That the only thing that has been done to these eight engines has amounted to replacing the heads, grinding and replacing the values, etc.?

Yes. And to listen to those eight engines today you'd think they only had about 10,000-hours on them!

What accounts for this incredible engine life?

First, proper rating—we're not overloading the engines and they're always running warm. Second, we're very careful about lubrication and cleaning the filters and air cleaners. And, of course, you've got to remember that diesels are designed for this kind of tough service. Pick a good one, take good care of it—and then you can expect to have it with you for a long, long time.

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- ☐ Railroad Transportation
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- Other (explain) _____
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- ☐ Utility Power Plant
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- ☐ Engine or Equipment Manufacturer
- ☐ Engine or Equipment Distributor
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40

Outdoor Garage for Fleets

Tech Products has introduced its TPI engine heater, designed to produce easy cold-weather starting. Mounted under the hood and plugged into 110 or 220, the automatic thermostat cuts on at 40° circulates the heated coolant by thermosyphon action. It cuts off at 100°, stays off until temp drops to 40° again.

41

Mid-Size Steam Cleaner

Clayton Mfg. Co. has introduced its Clean-Master "200", completing its cleaner line ranging in output from 60 to 600-gph. Equipped with remote automatic control, unit is in full operation only when steam cleaning is actually in progress, making it economical for varied work loads. Fleet operators, industrial plants, equipment dealers and contractors will find this a factor.

42

Open-Gear Lube in Spray Can

Spray Products Corp., known for its spray starting fluid, now has a pressurized spray can of lube for open gearing on cranes, crushers, tractors, winches, shovels, etc. Also serves as a fifth-wheel lube. Called Open Gear Loob, just shake the can, remove cap, aim and push. No need for pails, brushes and paddles.

43

Valve Guide Tool

A precision tool specifically to service worn valve guides is available from Hall-Toledo. With a hand drill, worn guides can be taken to standard oversize prior to installation of replaceable valve guide bushings. Alignment is through a combination valve seat and valve guide adapter, to guarantee center line concentricity. Model GT services all valve systems, or components may be purchased in basic sets.

44

Sioux Air Wrench

A heavy-duty 1-in square-drive air impact wrench has been announced by Sioux (Albertson & Co). The housing has streamlined low resistance air passages that move more air at higher speeds to accelerate the wrench rapidly for faster rundown. With job completed quickly, net time and air consumption per job is low. Reversing and volume control are right-hand operated; bails provide for horizontal or vertical suspension; adjustable handle can be moved to four positions.

45

"Do-It-Yourself" Fresh Water Kit

A line of low-cost compact heat recovery evaporators has been announced by Maxim Evaporator Div. of AMF. The new evaporators convert salt or brackish water to U. S. Dept. of Health standards at no fuel cost, using engine jacket water as heat source. Vacuum evaporators boil water at 125°, minimizing scale formation. Offshore drilling rigs, construction camps, mines, remote military installation—anywhere there is an internal combustion engine (or other hot water source) provide as much as 5-gal/day of fresh water. Unit capacities range from 500-12,500 GPD.

46

Low-Cost Filter Replacement Pack

Regular Dieselpack "500" has been announced by Luber-finer for trucks with up to 5-gal capacity. Developed expressly for cleaning heavy-duty compounded oils, Luber-finer claims to remove solids and colloidals without adversely affecting the additives. Service life is 4000-7000 miles.

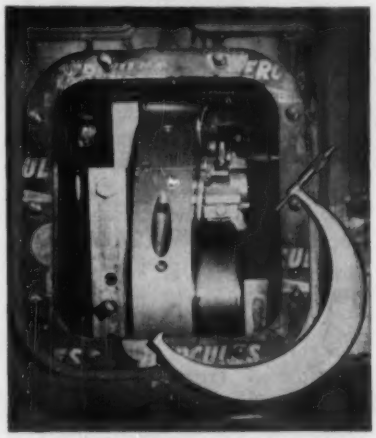
47

CP Conditioner

An oil conditioner and residual gum solvent known as CP (Conditioned Power) has been announced by Winslow Eng. & Mfg. Co. CP releases sticky valves and lifters, protects metal from carbon deposits, rust and corrosion, and if properly used results in decreased fuel and lube oil consumption.

48

WE'VE OPENED THE DOOR TO GREATER SAVINGS



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diesel power

new literature

Filter Bulletin

A 4-page bulletin "How to Enjoy More Miles of Effective Filtration at Less Cost" compares various filtering media, with contaminant removal test results shown in chart form. Bulletin was prepared by Luber-finer, Inc. Will be helpful in selecting proper type filter for your application. **49**

Fork Lift Data

Industrial Truck Div. of Clark Equipment Co. gives a full description of their two large general-purpose fork lift Ranger 600 and 700 trucks. The bulletin details speed, grades and underclearances, engine and electrical systems, power trains, hydraulic systems, and maintenance information. Dimensions are carefully outlined in drawings on the back cover. **50**

FULTON SYLPHON SAFETY CONTROL—MODEL 530 BRAND NEW . . . $55.00!

Government Surplus, BRAND NEW, in factory packages. List Price $125.00. Provides positive protection against high water jacket temperature and low lubricating oil pressure. Adjustable temperature cut-off range 180-210 degrees; max. oil pressure 75 lbs.; adjustable cut-off range 2-25 PSI. Automatically shuts off engine fuel oil supply and drains fuel line between shut-off valve and injection pump. Supplied with 6' long tubing to temperature bulb. 11" h., 6" w., 2¾" deep. Shpg. wt. 12 lbs. FOB Chicago.

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Custom Tachs

Electro-Mechano's revised bulletin is now available, describing representative types of custom tachs. Two new styles have been added, and there's no charge for looking. **51**

Film for Interested Groups

A 12-min 16-mm color film with sound is available for showing by groups with a legitimate interest. The film is built around the operation of Euclid's Model TS-14 scraper. **52**

Good Reading

Nordberg Progress, Nordberg Mfg. Co.'s quarterly magazine, helps keep you posted on new applications of diesel-powered machinery and processes. Qualified people can get on the mailing list. **53**

Tach Booklet

Barbour Stockwell Instruments has an illustrated brochure describing their Reliance line of tachometers, adapters, flexible shafts, clutches and gear boxes. If you're responsible for a tach of any kind, it's worth looking at the hook-ups that are possible. **54**

Bad Odor or Good!

A 24-page technical bulletin containing the latest data on gas odorants and their application is available from Oronite Div. of California Chemical Co., a subsidiary of Standard Oil of California. Our information is that this bulletin is the most comprehensive information ever compiled. The report features a special section on odorization, and detailed descriptions of eight different odorants. **55**

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Reclaiming Cranks

American Crankshaft Co. has issued a brochure telling the story of the Arcplated crankshaft. Frequently, cranks that appear to need replacement can be saved, at substantial savings. The reclaiming process is interesting. Brochure is free. **56**

Crawler Tractors

Allis-Chalmers has a new catalog describing utility applications for their farm-type crawler tractors. You might pick up a few new uses for your present unit, or discover that you have enough tractor work to warrant buying one. Catalog is free. **57**

Cold Repair

Metalock's file-folder type brochure describes their system of cold repair for cracked and broken castings and forgings. They describe repairs on location, eliminating extensive down time. Available on request. **58**

Technical data

If you're an engineer, or work in an associated field, Clark Equipment Co. has published a catalog that could very well be called an engineer's second brain. Formulas, conversion factors, definitions—all the things we'd like to have stored away in our memory for immediate reference. Tear out the reader service card and ask for one. **59**

Silencing Bulletin

A six-pager is available from Industrial Silencer Div. of Burgess-Manning Co. on their SDF combination cleaner-snubber. The unit is designed to be used in place of separate air intake filters and silencers for reciprocating compressors, positive-displacement blowers, and naturally-aspirated or positively-scavanged gas or diesel engines. **60**

Liquid Handlers

An eight-page catalog from Blackmer Pump Co. outlines and describes the company's entire line of liquid material handling equipment: power driven pumps, variable capacity pumps, proportioning systems, strainers, hand pumps, truck pumps, aluminum transporter pumps, and liquified gas pumps. The incidental data included is worth looking at if your business treats of handling liquid. **61**

NEW LITERATURE . . .

Cooling System Info

Young Radiator's latest catalog describes in brief their complete line of heat exchanger equipment. Also, it lists specific catalogs to ask for on each individual phase of heat exchangers, water jackets, etc. **62**

On New Tools

Albertson & Co., Inc. are offering a large, comprehensive catalog with all the air and electric tools, as well as accessories, in the famous "Sioux" line. Illustrations, specs and incidental info is valuable to any shop. Also includes full price listings. Good tools save time: find out what's new. **63**

Synchronous Generators

Electric Machinery Mfg. Co.'s latest bulletin describes a line of a-c generators in ratings from 3.75 through 62.5-kva, packaged without voltage regulators. Featured are prelubricated "for life" bearings; speeds ranging from 1000-1800-rpm; one or two-bearing construction; 50 or 60-cycle. **64**

Interesting Reading

Production Road, Twin Disc Clutch Co.'s quarterly magazine, usually has articles of interest to dieselmen. Latest issue talks about the Manitowoc 4500 "Vicon" excavator with two diesels and two torque converters. One engine powers travel and swing: the other controls the digging operation. Throttle control also engages the clutch. If you want to know more, send for Production Road. Maybe you can get on the mailing list. **65**

Glen Canyon Dam Film

"Bridge to the Future" is a 30-min 16-mm full-color sound film offered by International Harvester as a second salute to the building of Glen Canyon Dam in Arizona. The film carries from the summer of '58 to the summer of '60. Dam will be completed in '64.

The Glen Canyon project calls for one of the largest fleets of motorized equipment ever assembled for a single peacetime construction job.

"Bridge to the Future" can be had on loan. **66**

Tractor data

Allis-Chalmers has just made two catalogs available, concerning the salient features of the D-15 and D-17 tractors. Illustrations tell the story in pictures, and there's a full listing of specs. **67**

Generating Plants

The entire line of Onan Electric generating plants is listed on a catalog sheet prepared by Onan, Div. of S-P. Both illustrated and described are the smallest (500-W) to the biggest (230,000-w), with full details, characteristic and dimensions. **68**

On Transmissions

A copy of Fuller Transmission Div. of Eaton Mfg. Company's "Transmission Topics" magazine may be obtained by writing to Fuller. The magazine contains operations and application stories, as well as service information. A storehouse of information if your operation uses gears that have to be shifted. Write to get on the mailing list. **69**

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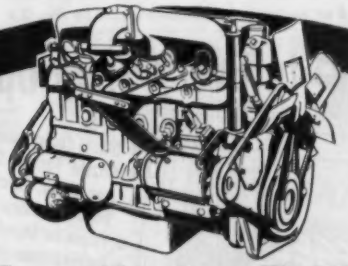

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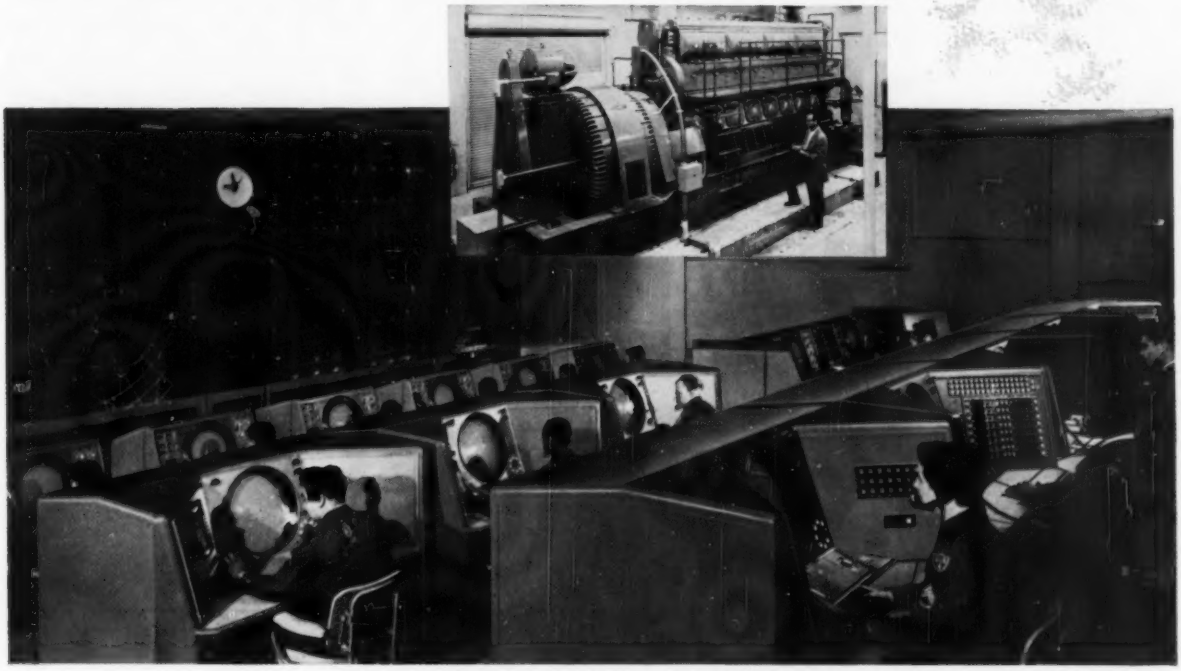

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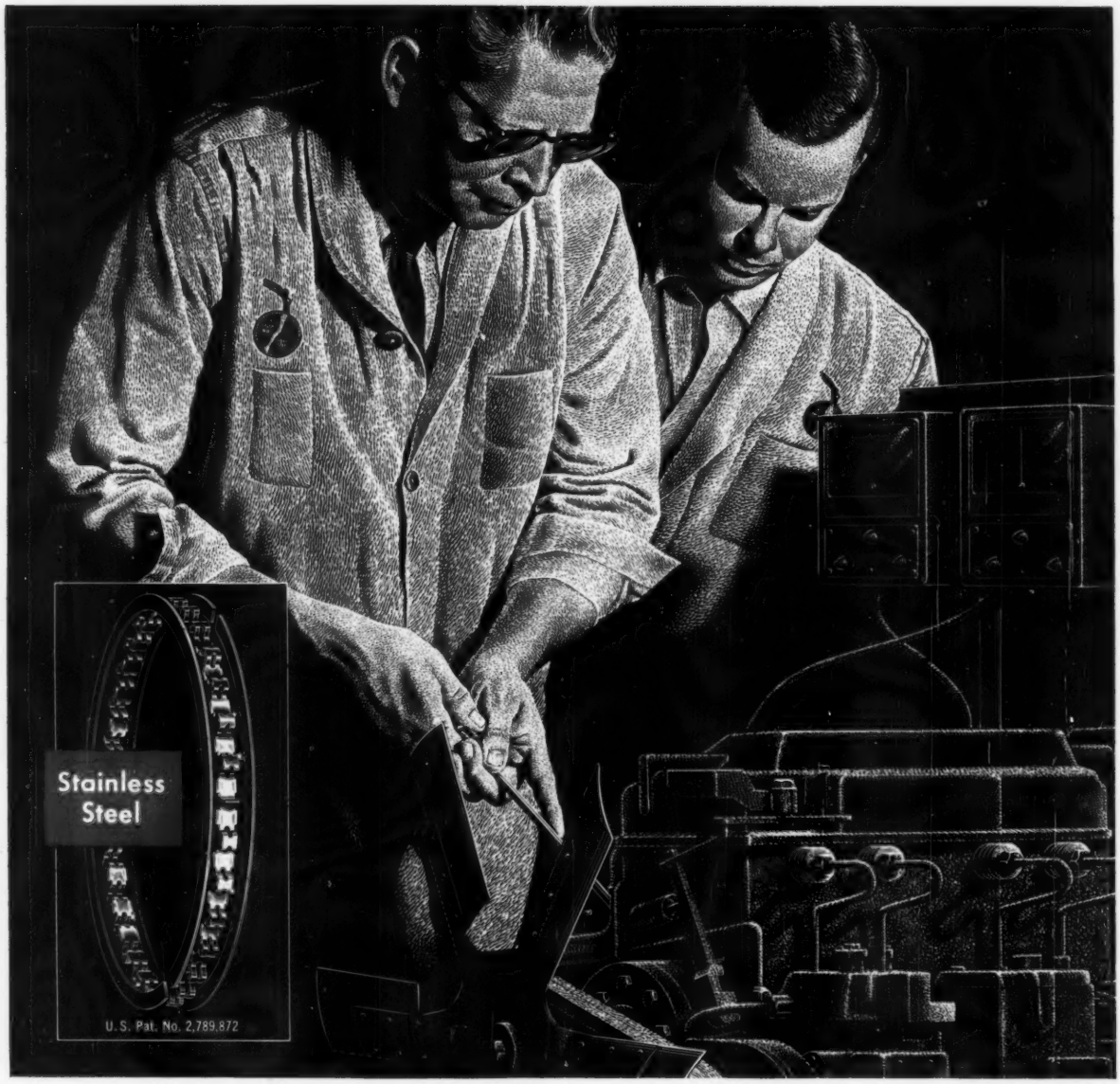

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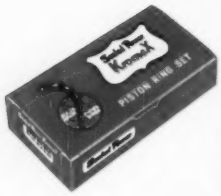

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